JUNE 1941 VOL. 13 NO. 6

# FOOD INDUSTRIES

M. A. WILLIAMSON, Publisher
LAURENCE V. BURTON, Editor
E. S. STATELER, *Associate Editor*, Chicago
G. L. MONTGOMERY, *Associate Editor*
F. K. LAWLER, *Managing Editor*
R. S. McBRIDE, Washington, D. C.
N. A. BOWERS, San Francisco, Cal.
PAUL WOOTON, Washington, D. C.
S. T. HENRY, Spruce Pine, N. C.
EARLE MAULDIN, Atlanta, Ga.

## FOOD TECHNOLOGY

**Baking**
Value of Ascorbic Acid in Baking.... 107
Moisture Determination in Flour and Biscuit ..... 107

**Dairy Products**
How Vitamins $B_2$ and C Affect Flavor of Dairy Products..... 107
Avoiding Bitter Milk..... 107
Corn Sirup Solids Improve Frozen Dairy Products ..... 68

**Meat**
How To Cure the Quick Cure..... 67

**Preserving**
How the British Make Jams..... 71

**Vitamins**
Effect of Processing on Vitamin A.... 108
Effect of Processing on Vitamin $B_1$.... 108
Rancidity in Flaked Cereals..... 108
Vitamin $B_1$ Assay by Fluorophotometry 108
Fortifying Milk with Vitamin D..... 109
Effect of processing on Vitamin C.... 109
How To Add and Control Vitamin A in Margarine ..... 39
How To Add Vitamin D Concentrate and Control Vitamin D in Milk..... 41
Irradiation and Control of Vitamin D in Milk ..... 43
How To Get Vitamin D into Milk by Feeding Cows Yeast..... 46
Irradiation and Control of Vitamin D in Cereals ..... 48
How To Conserve Vitamin C in a Liquid ..... 50
How To Add B Vitamins and Control Content in Flour..... 52
How B. A. Eckhart Milling Co. Makes Enriched Flour..... 53
Addition and Control of Vitamin $B_1$ in Cereals ..... 55
Vitamin Control for Baking Industry. 58
How To Sample Bread for Vitamin Assay ..... 59
How To Sample Flour for Vitamin Assay ..... 60
Quick Review of Chemical Methods for Determining Vitamins..... 63
Use of Yeast in Vitamin Control..... 65

**Miscellaneous**
Dairy Equipment ..... 109
Heat-resisting Mold in Blueberries... 109

**Management** — Trucks Streamlined for Traffic ..... 76

**Vitamin Control Symposium**
How to Control Vitamin Content ..... 35
The Purpose of This Symposium on Vitamin Control ..... 36
Defining Quality Control ..... 37
Problems Involved in Control of Vitamin Content ..... 38
Foods Deserving Attention ..... 39
How To Add and Control Vitamin A in Margarine ..... 39
How To Add Vitamin D Concentrate and Control Vitamin D in Milk ..... 41
Irradiation and Control of Vitamin D in Milk ..... 43
How To Get Vitamin D into Milk By Feeding Cows Yeast 46
Irradiation and Control of Vitamin D in Cereals ..... 48
How To Conserve Vitamin C in a Liquid ..... 50
How To Add B Vitamins and Control Content in Flour ..... 52
How B. A. Eckhart Milling Co. Makes Enriched Flour ..... 53
Addition and Control of Vitamin $B_1$ in Cereals ..... 55
Vitamin Control for Baking Industry ..... 58
How To Sample Bread for Vitamin Assay ..... 59
How To Sample Flour for Vitamin Assay ..... 60
Role of Independent Laboratory in Product Control ..... 61
Quick Review of Chemical Methods for Determining Vitamins ..... 63
Use of Yeast in Vitamin Control ..... 65

**Quality Control**
How To Cure the Quick Cure ..... 67
Corn Sirup Solids Improve Frozen Dairy Products ..... 68
Program of Institute of Food Technologists Meeting ..... 78

**Production** — How the British Make Jams ..... 71

**Engineering** — Boiler Water Conditioning Avoids Trouble and Expense ..... 74

**Every Month**
Talk of the Industry.... 31
New Packages, Products. 79
Automotive ..... 76
The Food Industry News. 81
Business Trends ..... 91
Men, Jobs, Companies... 95
Food Equipment News... 99
Catalogs ..... 105
Food Technology ..... 107
Books ..... 111
Patents ..... 112
Formulas ..... 117

## ★HOMES OF FAMOUS FOODS

On the cover is the big two-story brick and steel plant of Land O'Lakes Creameries, Inc., at Minneapolis, Minn. Located in the open, the factory is well lighted by day with large windows along the sides and ends. Shipping facilities are provided by a railroad spur.

McGraw-Hill Publishing Company, Inc., James H. McGraw, Founder and Honorary Chairman. Publication Office: 99-129 North Broadway, Albany, N. Y. Editorial and Executive Offices: 330 West 42nd Street, New York. Branch Offices: 520 North Michigan Ave., Chicago; 68 Post St., San Francisco; Aldwych House, Aldwych, London, W.C. 2; Washington; Philadelphia; Cleveland; Detroit; St. Louis; Boston; Atlanta, Ga. James H. McGraw, Jr., President; Howard Ehrlich, Executive Vice-President; Mason Britton, Vice-Chairman; B. R. Putnam, Treasurer; D. C. McGraw, Secretary; J. E. Blackburn, Jr., Director of Circulation.

Published monthly; price 35c a copy. Allow at least ten days for a change of address. All communications about subscriptions should be addressed to the Director of Circulation, 330 West 42nd Street, New York, N. Y. Subscription rates: United State and possessions, Mexico, Central and South American countries, $3 a year, $4 for two years, $5 for three years. Canada, $3.50 a year; $5 for two years; $6 for three years (payable in Canadian or U. S. funds). Great Britain and British possessions, 30 shillings for one year, 60 shillings for three years. All other countries, $5 a year, $10 for three years. Entered as second-class matter Aug. 17, 1936, at Post Office, Albany, N. Y., under the act of March 3, 1879. Cable address: "McGrawhill, N. Y." Member of A.B.P. Member of A.B.C. Contents indexed monthly in the Industrial Arts Index. Copyright, 1941, by McGraw-Hill Publishing Company, Inc.

A McGRAW-HILL PUBLICATION

# This Issue

## RICH DOSE ON VITAMINS

This matter of the vitamin content of foods, so much in the public eye at present, can be approached in two ways.

From one point of view, dependence should be placed alone upon the natural vitamin content of foods. Processed foods should be so processed as to retain these natural vitamins. And consumers should be so educated that they will choose foods that will give them a vitamin intake that will assure the high level of nutrition required for good health.

Opposed to this view are those who say that no attempt should be made to change consuming habits. They advocate, instead, the addition of vitamins to foods that are universally used, in such quantities that all consumers will get the vitamins they need.

As with most controversial matters, the course finally adopted will likely be a compromise. Natural vitamin content will be preserved when such a course is reasonable in cost and is convenient. And vitamins will be added where that proves to be the most feasible course to follow.

So the food man will need to keep abreast of progress along both these lines. As a first step, he should read the symposium on this subject, beginning on page 35 of this issue of FOOD INDUSTRIES. In it, leading research men and production men from the industries involved tell what has been done, to date, to preserve natural vitamins in foods or add vitamins to foods that lack them.

## COLD, BUT SMOOTH

All sorts of things can (and in some places do) go into ice cream and frozen desserts. While some of these might better be left out, research is showing that other possible ingredients give definite advantages. One of these is corn sirup solids, and the improvements that follow its use in ice creams, sherbets and water ices have been determined through researches recently completed at Massachusetts State College. Messrs. L. R. Glazier and M. J. Mack, well-known food technologists of that institution, tell the story in FOOD INDUSTRIES this month. See page 68.

## CURE FOR THE QUICK CURE

During the past few years many a consumer has been heard to ask: "Where can I get some good ham?" The reason is that many packers have improperly used new quick curing methods. Now the quick cure will produce good meat, and it affords some very definite economic advantages for the packer. And to help avoid the pitfalls E. S. Hurd, meat consultant, has provided some pointers on what and what not to do in quick curing meat. Page 67.

# Coming

## WAR, WINE AND OPPORTUNITY

The American public has long had the idea that the only way to get good wine was to say it in French. But the British blockade has cut off French and other European wines. Which provides a tremendous opportunity for Western Hemisphere wine makers to build a new and lasting business in fine wines.

What American vintners can, and are, doing to take advantage of this situation will be told by Allen Chaffee, who has just completed a special study for FOOD INDUSTRIES.

## DON'T LET IT FLOOR YOU

The problem of maintaining clean wear-proof floors in a food plant has gotten into the hair of practically every man in the food industries at one time or another. For the acids, alkalis, grease and water that get onto the floor in food plant operations raise havoc with flooring materials.

Because of this problem, FOOD INDUSTRIES will run a series of articles on floors. These will arrive at the answers by considering food factory floors as engineering structures which are subject to physical laws and exposed to attack by numerous chemicals. The author knows his floors, being a civil engineer who has specialized in the construction of floors for food plants. The name is Richard Kanegsberg.

## CAREFUL WHAT YOU CALL IT

What to put on the label of a food product to meet the requirements of the Food, Drug and Cosmetic Act is a question that has bothered many a food manufacturer during the last three years. So to throw some light on this problem, Gordon McBride has sifted the general principles from 220-odd answers which the Food & Drug Administration has made to labeling inquiries from the food industry. And he has incorporated them into a practical article to appear in an early issue of FOOD INDUSTRIES.

## STILL MORE ON VITAMINS

This issue of FOOD INDUSTRIES was forced to go to press before some of the late comers arrived on the scene for the vitamin symposium. But what these men have to say on the subject is a very important part of the whole picture. So even though we had to "include them out" in June, to paraphrase our Hollywood friends, you can look, with profit, for their contributions to this vital subject in the next succeeding issues. Vitamin addition and control is an important subject, and it will continue to be important in the future.

# FOOD INDUSTRIES

Established 1928 — McGraw-Hill Publishing Company, Inc.

LAURENCE V. BURTON, Editor

Volume 13, Number 6 June 1941


# The Talk of the Industry

★ AN IMPORTANT FACT to be ascertained by each industry that goes in for addition of vitamins and minerals to its products, is the cost of enrichment ingredients *and* the cost of control.

In some lines of production the cost of control, including the cost of biological assays, laboratory control and other control expenses, bids fair to rival ingredient cost.

★ SPEAKING of letters to the editor, by actual count last year FOOD INDUSTRIES answered 551 letters that were merely letters of inquiry about this and that, mainly asking for information about how to accomplish some desired end—letters that had absolutely nothing to do with the normal procedure of getting out the magazine. So voluminous has the correspondence grown that it can be truly said that we are getting out two magazines, one of which is typewritten. And all of the effort of answering such technical inquiries has gone for naught except to provide a single correspondent

with the desired information (when we have been able to supply it).

What would *you* think of publishing these letters of inquiry and their answers? The correspondent would be identified only by the state in which he lives, except in cases where more complete identification were authorized. And the purpose of publication would be to place before the entire industry in permanent form the fragmentary bits of information that are important enough to somebody to cause him to make the effort to write to us. The theory is that where one man will write to this office there are probably anywhere from 100 to 500 other persons who are seeking similar information but do not write.

Please tell us what you think about it, or else forever after hold your peace, even when it takes us more than 60 days to answer your letters.

★ SPEAKING OF FORMULAS for industrially manufactured foods, if any young food technologist is looking for information on self-rising flours and the functions of the several ingredients, as well as certain quantitative information, he is urged to procure the April 1, 1941, *Federal Register*. Beginning on page 1729 are found the Proposed Findings of Facts about products made in flour mills from wheat. These are deserving of careful study by anyone who is beginning a career in food technology for they represent a composite of the viewpoints of the entire milling industry.

But please do not write to us for our copy of the *Federal Register*. It is not for loan or purchase. You can buy your own from The National Archives of the United States, Washington, D. C. Price 10 cents; cash, not stamps.

★ "DYNAMITE" is the name of a tabloid news sheet hawked on the streets of large cities for five cents. Its screaming headlines denounce certain food companies for selling "Filthy Crab Meat" or "Weevilly Flour" and the like. And if one reads the text of the various articles, one recognizes the exact language of

"Notices of Judgment, Food & Drug Administration."

It is not libelous because it quotes court decisions or final legal disposal of cases by F&DA against certain products. But it is misleading to the uninformed, for it fails to tell the purchaser that he could have the original document free for the asking.

★ NUTRITIONAL NOTE—That the United States is on the threshold of remarkable achievements in the field of public health is the opinion of those in highest authority in those branches of the government that are directly concerned with public health matters. This distinction is made in order to separate those whose training and experience has been solely in the fields of economics and sociology and relief from those who are professional practitioners of medicine and public health. Some of those in the medical group compare the present time with a period many years ago when the principles of sanitation were first discovered and applied. And they express the belief that just as improved sanitation of food and our environment has led to a great improvement in our public health

and expectancy of life, a corresponding improvement in our health, vigor, stamina and morale may be expected from improved nutrition, to be achieved principally by the enrichment of commercially manufactured foods with vitamins and minerals.

With such an expression of hope coming from responsible public health officials trained in the science of medicine, there can be no sound disagreement other than that which might arise from those equally trained and experienced in the combined fields of medicine and nutrition. For the layman is not in a position to affirm or deny such prophecies. The rest of us can only hope that they are true, and that the millennium of physical well-being is beginning today.

### *Credit Due to Vitamin Producers*

To those who enjoy philosophical speculation, the foregoing affords a splendid opportunity to inquire into what has made it possible for responsible officials to make such predictions. Is it research in the field of nutrition that has made it possible? Or is it research in the field of synthetic organic chemistry leading to the production of commercially synthesized vitamins on a large scale that makes it possible to forecast such wholesale improvement in national nutrition?

It is obvious that each achievement is somewhat dependent on the other. It is also apparent that without adequate commercial sources of vitamins or vitamin concentrates, any large-scale improvements in the nutritional qualities of processed (and even unprocessed) foods would of necessity be delayed until new methods could be discovered that would permit development of higher natural vitamin content in the unprocessed food, or of a much improved method of vitamin conservation as compared to the commercial processes that exist today. If, indeed, the nutritional millennium is here, then full credit must be given to those who have made commercially enriched food a technical possibility.

### *Legal Obstacles to Better Nutrition*

Intellectual honesty also demands that the social welfare crusaders give proper credit to the food industries that have gone far in applying the most recent knowledge of nutrition without any official stimulus from Washington. As a matter of fact, there have been many official obstacles to be overcome, and many more still remain. Federal Trade Commission activities of late have been directed towards preventing the enrichment of margarine with vitamin A, the impetus for action coming principally from organizations of dairy farmers. Certain rulings by the Food and Drug Administration, the wisdom and propriety of which are not being debated here today—this being merely a recital of some of the known facts—have prevented the use of the most economical methods of retaining vitamin C in tomato juice. The Bureau of Animal Industry until recently was adamant in its refusal to even consider the possibility of enrichment of any product made from animals where the Bureau may have jurisdiction. On February 28, 1941, however, this stand was reversed and manufacturers of margarine containing animal fats and oils are now permitted to fortify their product with fish liver oils and concentrates. And Congress sometime ago enacted a law that prohibits the use of natural fats containing color (principally carotene—a form of vitamin A) for the production of bread spreads or shortening without the payment of excessive taxes, the technical result of which is that such natural fats must be bleached, thereby destroying the vitamin A which is naturally present. These are a few of the obstacles that have been in the way of improved national nutrition. Yet progress is still being made.

### *Government Program*

Still pursuing the philosophical aspect of improved national nutrition, we now come to the unusual situation where the power and prestige of the United States government, from the President down, is being put behind the campaign to educate the public to eat and to demand foods of complete nutritional properties —largely the enriched processed foods. And this is occurring despite the fact that most of the commercially practical means of enrichment are patented.

War-time conditions have created an odd situation. It is to be hoped that the government will be consistent in its nutri-

## *Hors d'Oeuvres*

★ A new auto tire is being advertised as toughened with a vitamin-like chemical combination, "Duramin." Wonder if they didn't discover that "vitamin" in 35-cent steaks?

★ *Included in the America-to-Berlin cable blitz was this one: "Suggest hiring Gaston to broadcast. He's a better wine salesman than Ribbentrop and is nuts about the good old U.S.A." Gaston, in case you never listen to the radio, is the air-wave salesman for Chateau Martin.*

★ Repeal of Prohibition eight years ago, say the brewers, "marked the restoration of liberty" in the United States. Now to keep it we have to repeal Hitler.

★ *German scientists at the University of Hamburg say that whale meat suitably prepared resembles beef in appearance and taste. But by now the Germans probably have forgotten what beef is like.*

★ That proposed 20 percent sales tax on soft drinks would make kindergarten economics a bit complicated. The kids would have to hit pop for the nickel for the pop and auntie for the penny ante for Uncle Sam.

★ *People used to think it terrible if "chemicals" were put into foods. Now they think it the berries to get food enriched with something like sodium iron pyrophosphate.*

★ Headline: "Need More Eggs to Aid Defense." . . . Ripe ones?

★ *The aluminum that goes into a big bomber is enough to make 60,000 coffee percolators. And just as effective in keeping people awake.*

★ These days the bakers are singing: "Vitamin Trails To Vitalized Sales," or "On the Trail of the Lonesome Dime."

★ *We just received a letter addressed to "Food Inventory." The writer must have seen our waistline.*

★ Farmers derive an income of about $600,000,000 and distributors $300,000,000 a year from hens eggs. Who said the goose laid the golden egg?

★ *"Where does milk come from?", a teacher in Vichy, France, asked a class of schoolboys. "From America," came the reply, "It's a powder."*

★ The 1,400,000 men soon to be in the Army will consume each day 1,000,000 lb. of meat, 600,000 lb. of potatoes, 500,000 lb. of fresh fruit, 110,000 lb. of coffee, 125,000 lb. of butter, 700,000 quarts of milk and $50,000 worth of bread. What, no sawdust? No blitz food?

★ *In making jam in Syria the natives spread it on cloths and let it dry in the sun in sheets. Just what the drugstore lunch counters need for quick-service sandwiches.*

★ A "drip pan" for ice cream cones is the invention of a Maryland food manufacturer. American genius is extant.

F. K. L.

tion program and remove the legal obstacles to more nutritive processed foods.

## *Too Much Paternal Affection*

A MANUFACTURER who has several sons, or even one son, or a promising son-in-law, is not to be roundly condemned if he brings the boys into the business which he owns outright. To be sure, many a business needs energetic younger men to criticise, ask questions and supply the ginger which often peps the place up. Yet there is another side to the problem that deserves equal consideration.

Take the actual case of a small-size food monufacturer who needs a food technologist if a concern ever needed one. Two sons and a son-in-law have recently been added to the payroll in the overhead bracket. Not one of these likeable youngsters has had any training in anything even resembling food technology. No chemistry, no engineering, no biology, no bacteriology—nothing of current use to the business. All three have had splendid liberal educations, which is not to be decried. But poor old Dad is worrying about his declining sales volume, and the years and years of profitless operations. Also some nasty red figures.

In these days of tough going, one cannot blame the boys for their choice of jobs. Yet it seems to be short-sighted on their part to load down a profitless business with overhead, even though the enterprise may sometime become theirs by inheritance.

The owner sadly believed that he could not—should not—insist on their study of subjects that were distasteful to them when they were in college.

Well, if food technology was distasteful while they were in college, what will it be like when the boys are actually owners of the food business? It would appear that the boys have got to master it now and like it! Or else the business will not survive.

Poor Dad.

## *Predicting the Unpredictable*

SO MANY contrary events have occurred since this war started that anyone is justified in being very skeptical just the moment public assurances are put out that such-and-such will, or will not happen. To illustrate:

Industry was at one time assured that priorities would not be needed. Industry was once advised that deferments of drafted men would be resisted to the utmost, yet Major Battley recently told the American Chemical Society that chemists should be given deferred classification. England would not purchase food from the United States. There was no shortage of skilled mechanics. The industrial mobilization plan was perfected to the *n*th degree . . . But go on and write your own.

Every one of these assurances and statements has been overturned or cast aside. Now let's look at some of the more recent assurances:

Cost of living will be held down, says Leon Henderson. No meatless, wheatless or sugarless days are foreseen, says Harriett Elliott. Farm prices will be raised to 85 percent of parity, decrees the House and the Senate. No possible shortage of petroleum products say spokesmen for the industry. Railroads can handle any future demand.

Again—write your own, hope for the best but be prepared for the worst.

## *Rumors*

AN OFT REPEATED, but unconfirmed, rumor has it that a bill is being prepared to give the President of the United States what amounts to dictatorial powers over the food industries. Some say it will give him control over prices and volume of production. Others say it will permit him to compel vitamin and mineral enrichment of any selected line of foods by executive order.

Between the powers already delegated to McNutt on welfare, Henderson on prices, and the Food & Drug Administration on control of many other matters, it seems unlikely that any other enabling legislation could create any other authority possible under the Constitution that does not now exist. Nobody has ever seem a draft of the proposed bill, but many claim to know of its existence.

Perhaps it is only a part of the projected education campaign to gain added publicity for enrichment.

## *Opportunity*

ONE OF THESE DAYS if shooting begins, some bright person is going to develop an inexpensive piece of small equipment for detinning used tin cans. It may be of household size; or it may be of neighborhood size, so simple that a high school boy who has studied chemistry can operate it. It might be as simple as a 10- or 20-gal. crock filled with a lye solution in which the boys would detin washed, clean tin cans without labels. Every so often a tank truck would come around and collect the solution, leaving a fresh can of lye. Or perhaps the boys could even boil the solution down in an iron kettle and save transportation costs on water. Since a thousand tin cans carry only about $0.75 worth of tin, the economics of the operation would be very sketchy. But it might result in considerable recovery of secondary tin in the populated centers, to say nothing of giving youth some useful work in a period of hostilities. (Or it might result in considerable destruction of boys' clothing.)

## *"It's Later Than You Think"*

OPM HAS STATED on May 5, 1941, that "between government stockpiles, inventories of consumers and manufacturers, and tin afloat, it is estimated that we now have sufficient tin to carry us through for about 14 months. In order to accelerate the acquisition of tin necessary for national defense, it is necessary to restrict its use."

Does OPM mean that this is a 14-month supply for the United States alone? If this is true then how long a supply do we possess if we are also to supply Great Britain with all the canned foods needed there? Add to this export demand the probable sinking of many cargoes enroute—shipments that must be replaced somehow, and then how much of a supply have we? If this is the case, our estimate is that the potential supply will not last ten months.

Users of tin may face important problems earlier than they think in spite of the orders by OPM to reduce the amount of tin on tin plate. This pessimistic view will be somewhat brightened if the new tin smelter in Texas gets into production in time.

In the words of William F. Knudsen: "It's later than you think."

## *Problems of Tomatoes For Britain*

UNDER the Lease-Lend Law, Britain is supposed to get some 15,000,000 cases of canned tomatoes, but reports are coming in that tomato packers are having difficulty in contracting for the necessary increase of acreage. Causes of the difficulties are several:

Tomato plants for setting out are reported scarce in many regions.

In California there is a demand for a 30 percent increase in wages for union cannery workers, which makes the canners reluctant to take a chance.

Canners themselves are trying to ascertain whether the goods must be packed under the restrictions of the Walsh-Healey Law.

In the Eastern States there is a tendency for farmers to take a gamble on the open-market possibilities of tomato growing. Here it has been estimated that

the planted acreage will be 15 to 20 percent above 1940, but packers will have to bid for this overage if open-market prices are higher than contract prices in August and September.

And on top of all the foregoing problems, the Army and munition plants have drawn away large numbers of male workers who would otherwise be producing the crop—to say nothing of the possible shortage of workers in the packing season, or the vagaries of weather.

Only the Central States appear to be making methodical progress in the desired direction.

## *Wage-Hour Problem Affects Berry Users*

STRAWBERRY CAPPING—pulling the caps and stems from strawberries—is likely to create a problem for freezers, canners, preservers and all who use strawberries, such as pie bakers and manufacturers of ice cream, confectionery and flavoring sirup. Under the Wage-Hour Law, cappers working in factories must be paid the minimum wage, and this creates a serious problem of relative costs for competing regions. Eastern concerns, employing chiefly Negro women who sing hymns and spirituals as they work and cap the berries to the same slow tempo, have heretofore solved the problem by piece-work compensation. Previous rates have been about 1½ cents per quart. The women came and went as they pleased and, because of their irregular hours and the slow tempo of their capping, their individual production was often small with correspondingly low total wages. But they seemed to be happy and satisfied.

Under the current requirements of the Wage-Hour Law the cappers must be paid a minimum wage that puts some production costs clear out of line with other producing areas. In the Pacific North-West the berries are capped by the grower as they are picked so that the buyer receives only capped berries. In Louisiana the custom is different, the grower capping the berries after picking, which has recently cost the grower 2 cents per quart, or about 2 cents per pound as sold to industrial buyers. But in both cases the capping is apparently a farm operation and the minimum wage seemingly does not apply. Required by law in Florida, and by established custom elsewhere in the East, the capping is done in the factory where minimum hourly wages must be paid.

Mechanized capping would seem to be the answer, but capping machines are patented and not always available to all comers. Furthermore, these machines appear to be technically successful only with certain varieties of berries and do poor work with other sorts.

Unless the more fortunately situated areas of the country will hold a price umbrella over the others, the possibility exists that the high-cost areas will shut down after they have operated long enough to ascertain their current costs. This will keep them from losing money on operations but it, in turn, will deprive the farmer of his volume market, and huge numbers of Negro women of any employment, brief and seasonal though it may be.

And it may result in curtailed supplies of cold pack fruit, if the many packers decide they cannot recover costs from their 1941 operations.

## *Antioxygens*

THOSE who are interested in antioxygens, or rancidity-retarding substances, will find a discussion of the behavior of a few of them in an article by L. W. Elder, ***Oil and Soap* 18, 38, 1941. Not all are** effective under all conditions, and some are known to be definitely toxic. The list follows:

| | |
|---|---|
| Avenex (Raw oat flour) | "MEH" |
| Lecithin | Sarcosine |
| Iso-ascorbic acid | Cysteine hydrochloride |
| Gluco-ascorbic acid | Hydroquinone |
| Amino-glucose | Piperidine |
| Methyl glucamine | Piperazine |
| Methyl salicylate | Pyrrol |
| $K_2H$ $PO_4$ | Diethanolamine |
| Di-isopropanolamine | |

Again, we repeat, it should be definitely understood that not all of these are suitable for use in food, and one should be guided by a chemist or food technologist if experimentation with these substances is contemplated.

## *Foresight*

A CERTAIN food manufacturing executive who is noted for his foresight and usually anticipates all problems before they occur has done a stunt that may be worth duplication, wherever conditions warrant it.

Many key employees of his company are aliens, or are men whose loyalty to the company or the nation would be in serious doubt in case hostilities should begin. He does not anticipate actual sabotage, but he does fear their removal to concentration camps for safe keeping at that time, which, of course, would cripple operations. In either event he has taken quiet and unobtrusive steps to avoid any operating problems.

Each piece of equipment operated by a "doubtful" man has suddenly developed a need for unit operations study. A chemist or food technologist who has *not* been let in on the secret has been assigned to the task of making the study. The boss debates and argues each report and compels the youngster to make even more detailed studies until he is satisfied that the young man is letter perfect in the matter.

To prove it, in one or two instances he has told the "doubtful" man that the man making tests is getting cocky and thinks that he knows how to do the job as well as the workman. "Let's let him try it—but watch him so that he doesn't wreck the place."

Result: every job in the place, some of them calling for high skill, can be filled in an emergency by someone from the technical staff. Better yet, the technical man knows the job so well that he can teach it to any intelligent workman.

No important moves are planned, but all is in readiness if troubles come.

## *No Substitute for Sanitation*

EXPLAINING the use of added permitted preservative to a food that needed no preservative if proper plant sanitation were maintained, a plant man recently said:

"But it makes our plant operation so much easier."

Which means that he does not like to be careful, or is an admission that he will not or can not maintain proper sanitary discipline in his organization. Such voluntary destruction of morale and reputation is an evil to be shunned.

Preservatives have their proper place, but never should they be used as a substitute for cleanliness and sanitation.

## *Slow Progress of Enrichment in Britain*

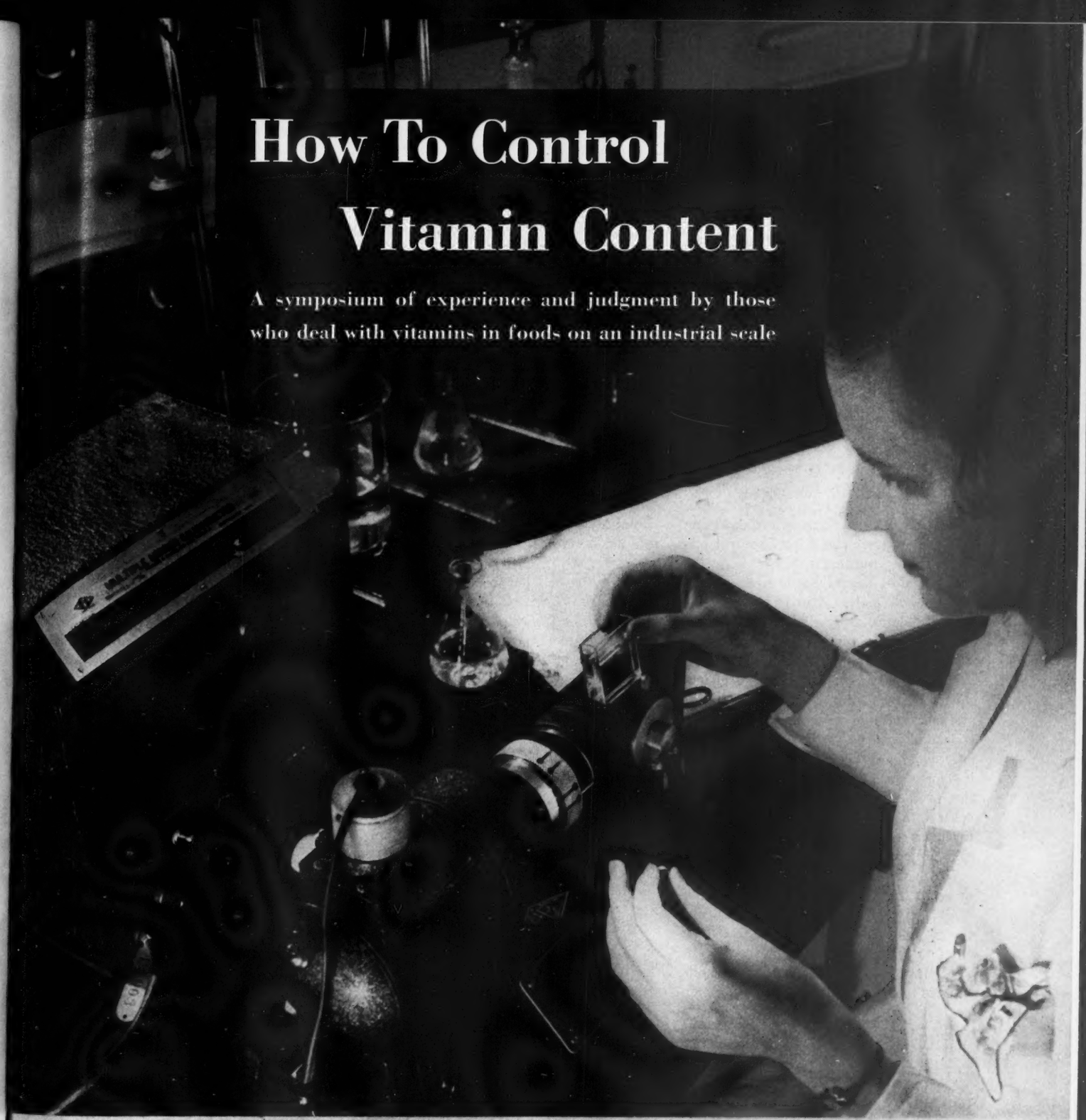
ENRICHED BREAD in England has not put in its appearance to the marked extent that had been expected when the Ministry of Food announced the plan some months ago. Aside from a moderate amount, produced by a high vitamin $B_1$ yeast, there is little enriched bread available today in Britain. Reasons for the delay are not forthcoming, though the war itself is probably the major factor.

But from the experience of the bakers who are using high $B_1$ yeast, it is learned that the cost of enrichment is a tangible element and, despite the government control of the price of bread, the bakers have been forced to recoup this loss by eliminating slicing and wrapping.

Which suggests that in the United States we are likely to find it necessary to have a higher price for enriched bread than ordinary white bread, notwithstanding certain important opinions that the cost of bread enrichment should be absorbed by the millers and bakers.

# How To Control Vitamin Content

A symposium of experience and judgment by those who deal with vitamins in foods on an industrial scale



Chemical assay of vitamin $B_1$ with a fluorophotometer. *Courtesy Merck & Co., Inc.*


The Purpose of This Symposium on Vitamin Control . . . . . 36
Defining Quality Control . . . . . 37
Problems Involved in Control of Vitamin Content . . . . . 38
Foods Deserving Attention . . . . . 39
How To Add and Control Vitamin A in Margarine . . . . . 39
How To Add Vitamin D Concentrate and Control Vitamin D in Milk . . . . . 41
Irradiation and Control of Vitamin D in Milk . . 43
How To Get Vitamin D into Milk by Feeding Cows Yeast . . . . . 46
Irradiation and Control of Vitamin D in Cereals 48
How To Conserve Vitamin C in a Liquid . . . . . 50
How To Add B Vitamins and Control Content in Flour . . . . . 52
How B. A. Eckhart Milling Co. Makes Enriched Flour . . . . . 53
Addition and Control of Vitamin $B_1$ in Cereals 55
Vitamin Control for Baking Industry . . . . . 58
How To Sample Bread for Vitamin Assay . . . . 59
How To Sample Flour for Vitamin Assay . . . . . 60
Role of Independent Laboratory in Product Control . . . . . 61
Quick Review of Chemical Methods for Determining Vitamins . . . . . 63
Use of Yeast in Vitamin Control . . . . . 65

# The Purpose of This Symposium on Vitamin Control

**To show the complexity and cost—To review industrial practices—To present the facts in proper balance**

TO the man in production or quality control work, matters of public policy on fortification or restoration of vitamins and minerals are of lesser importance than his own problems of how to do it, and how to do it properly. For it's up to the experts in nutrition, public health and medical science, collaborating with the statesmen and food control officials of the government, to decide on the social desirability of enrichment or fortification of foods. Also it is up to the latter to determine whether fortification or enrichment should be on a permissive status or if it should be mandatory.

Naturally, such government decisions should be reached only after consultation and collaboration with the various industries and experts concerned, for that is only common sense. But a decision having once been reached, it then becomes the problem of production and quality control to develop methods and routine to carry out the enrichment or fortification policy.

How very easy to arrive at a decision to do something about vitamins and minerals! But how difficult it is for men in the production and quality control functions to carry out that decision.

Management has its own peculiar difficulties too, for vitamins and even minerals cost money. And quality control costs money, too, even though it is indispensable in any well-operated food manufacturing establishment. If vitamins are added to processed foods, then there are certain standards to be met. Definite amounts must be added, and it must be absolutely certain that the vitamins are still there when the food reaches the consumer. This will often require careful planning, foresight, knowledge of handling and processing and, above all, careful supervision, checking and double checking. Management also faces the problem of how to get a profit—or break even—from this added investment, if it decides to go in for the addition of vitamins.

Some people in government activities are of the opinion that the cost of all this should be absorbed by the food industry and should not be passed along to the consumer. Yet one who gives much study to the many problems involved must soon realize that the dollars-and-cents business side of enrichment cannot be lightly waved aside by ill-informed official gestures. The conclusion is inescapable that there is much misconception in official Washington about the mechanics and the cost of vitamin control in food processing.

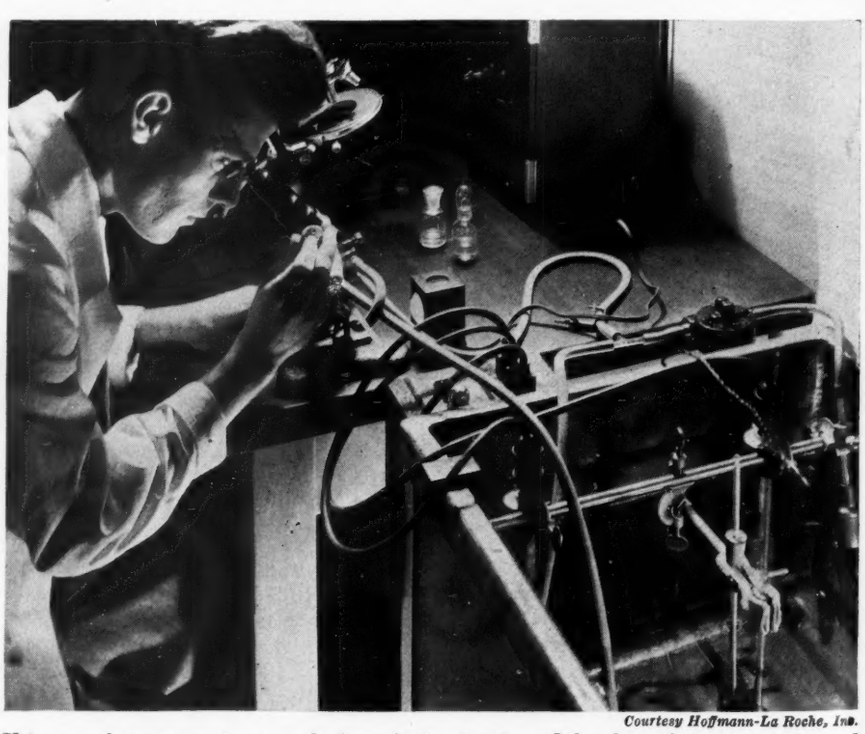
Therefore, one purpose of this symposium is to make available some much needed public information about the size, difficulty and expense involved. This purpose could be called a *public relations purpose.*

Two other purposes of technological character are also involved: First, to supply production and quality control men with a review of the best practices in many fields of this aspect of quality control; and second, to place before the industry the facts in proper balance.

In the current hullabaloo about enrichment of flour and cereal products with food factors from the vitamin B group, there is a tendency to lose from sight the fact that vitamin control and enrichment has been going on for some time in certain of the other foods. Enrichment as a practice is nothing new, although the term has gained some very spectacular publicity of late.

Food technologists who are facing important problems and decisions about vitamin control for the first time may be surprised at the character of the problems to be encountered.

In all of the discussions that follow, the primary concern lies in how to do a good job of vitamin control once that job is undertaken. Less concern is expressed about the nutritional wisdom of enrichment, than in how to do a perfect job as



*Courtesy Hoffmann-La Roche, Inc.*

**Using a refractometer in control of synthetic vitamins. Like the polarimeter, it is used for determining either the purity of a given liquid material or the concentration of a solution of a known pure material. The refractive index of a substance is an accurate criterion of its purity. The apparatus is maintained at constant temperature by circulating water taken from a constant temperature bath.**

*Courtesy Hoffmann-La Roche, Inc.*

**Determining the purity of a synthetic vitamin by means of a polarimeter. This instrument measures the degree of rotation of a polarized beam of light passing through a layer of the material. The amount of rotation is constant for a given material under specific conditions. The instrument will determine the concentration in a pure solution or the purity in a solution of known concentration. The apparatus at the left is a sodium vapor lamp for giving monochromatic light.**

economically and as nearly automatically as possible, if enrichment is officially decided upon.

But in enrichment of foods by adding vitamins is found only one aspect of quality control. Other methods exist which must not be overlooked. Vitamins that are naturally present can be conserved, instead of lost or destroyed, by the application of certain forms of improved food processing. Also, irradiation can be employed as a means of generating one of the vitamins in food.—THE EDITORS.

# Defining Quality Control

## Problem is one of producing a uniform product rather than getting as much vitamin into product as possible

AN erroneous notion of what is meant by "quality control" must be scotched at the outset, for in matters pertaining to vitamins there are many in the food industry who see in the vitamin enrichment program nothing more than a glorious opportunity to sell more foods by riding on the enrichment bandwagon. And the expected effect of such a policy is often an attempt to add more of this or that vitamin than one's competitor. In matters pertaining to vitamins it is wise for the manufacturer to move deliberately and to be conservative in his additions of enrichment materials to those foods where Federal definitions and standards of identity do not exist.

Quality control does not, as many erroneously believe, imply making the best possible product, or putting in the most vitamins. Quality control means something quite different. The emphasis is on *control*. The quality level may be whatever management or government regulations may define.

In controlling quality, the problem is to keep it uniform at whatever level of quality has been selected. In manufacturing foods the problem of quality control is more aggravated than in any other industry because of the extreme variability of natural raw materials. From these varying, and variable, raw materials it is necessary to produce a finished product whose quality does not vary. For the latter is the indispensible basis of commercial success. It is impossible to build up a successful business on the sale of consumer products that are never twice alike.

When considering the vitamin content of foods, regardless of how the vitamins get there, a new and somewhat different aspect of quality control is encountered than in other aspects of quality such as color, flavor, consistency or other physical characteristics. And because of this difference, also because of the frequent difficulties of detecting variations in vitamin content, a considerable portion of this issue of FOOD INDUSTRIES is devoted to reviewing the entire problem.

Control means restraint. To go the limit certainly is not restraint; nor is it control. To use a simple analogy: Suppose one were driving a motor car at, say 40 miles per hour. If one were to maintain a uniform speed of 40 m.p.h. it would be proper to say that the control of the quality of his driving was excellent. You close the throttle going down hill and open it going up hill, maintaining a uniform speed of 40 m.p.h. This uniformity would not be possible unless you had more power available than you ordinarily would use—also self restraint. Among motorists, good driving is usually regarded as smooth, *i.e.*, uniform, driving. It does not imply opening the throttle wide open whenever the going is easy. On the contrary, it means restraint. But one cannot exercise restraint unless there is something in reserve to use, when there is need, for the sake of uniformity.

To a well-trained food technologist of considerable experience, this rather elementary explanation is superfluous. And, if Federal definitions and standards existed for all foods with respect to their vitamin content, there would be little occasion for bringing up the meaning of quality control other than to emphasize the problem of conforming to the regulatory definition.

To summarize: Quality control means nothing more than the procedure of producing uniformity of quality by whatever means it may be necessary to employ. And generally these means are found in the plant—and to a lesser degree in the laboratory. Usually, the function of the laboratory is to ascertain if the plant operations have or have not succeeded in maintaining the desired uniformity. For that reason, it is advisable to dwell at length in this symposium on the mechanical equipment and facilities that effect or affect quality control. If plant facilities are adequate then the problem of control of quality becomes more nearly automatic and the advisory task of the laboratory is easier.

In checking up on the adequacy of control of quality with respect to vitamins, the following general methods are available:

1. Tests employed by the production men themselves.
2. Tests made in the plant laboratory.
3. Tests made in independent laboratories.
4. Records of automatic instruments.
5. Tests made by study of plant accounting records.

The last of these is not to be lightly dismissed but it is of little value unless exact records are kept of materials on hand and quantities produced. Furthermore, such records, to be of value, must be based on daily physical inventories, never on book inventories.

Carelessness in quality control with respect to vitamins is, unfortunately, not often self-revealing. For too much, to too little—or even complete absence of the needed vitamins—seldom produces an effect that is easily noticeable like an off-flavor or off-color. There are ways, however, to circumvent this problem, as will be explained. But carelessness can carry its penalties, nevertheless, for municipal, state and Federal agencies are increasingly policing the vitamin claims. If a food does not conform to the label claims or to its legal definition and standard of identity then that food may be deemed misbranded and it may be liable to prosecution.

# Problems Involved in Vitamin Content Control

**Preventing vitamin losses—Problems pertaining to materials, technology, equipment, plant operation, control, patents and management**

IN a field so complex as the food industry it is impossible to list all the problems that confront the production department in producing vitamin-containing foods of uniform content. The following items are, it is believed, the more important. All of them must be solved correctly in order to achieve proper vitamin quality control without unreasonable cost or difficulties. In other words, the list is merely a guide to one who desires to think through the production and sales aspects of vitamin control. Conceivably, this list may find its greatest use in curbing the impatience of those who are wholly without responsibility for meeting payrolls but are zealous for prompt action on the part of food manufacturers, so that the country may be "defended" by adequate vitamins in our daily food.

1. Preventing vitamin losses in process:
   - Destruction by chemical deterioration:
     - Metals of construction of equipment.
     - Action of oxygen.
     - Action of high temperatures.
     - Action of other ingredients or treatments.
   - Physical losses:
     - Vitamins too coarse to go through fine sifting equipment.
     - Methods of preparation.
     - Methods of processing and separating.

2. Sources of supply of enrichment materials:
   - Dependability of supply.
   - Uniformity of supply.
   - Cost of supply.
   - Freedom from detrimental qualities.
   - Physical characteristics of materials.
   - Packaging of supply.
   - Storage of supplies.

3. Technology of adding enrichment:
   - Where in the process.
   - Sequence of additions.
   - How to mix to secure uniform distribution.
   - How long to mix.
   - Possible adverse effect of other ingredients.
   - Batch mixing *vs.* continuous mixing.

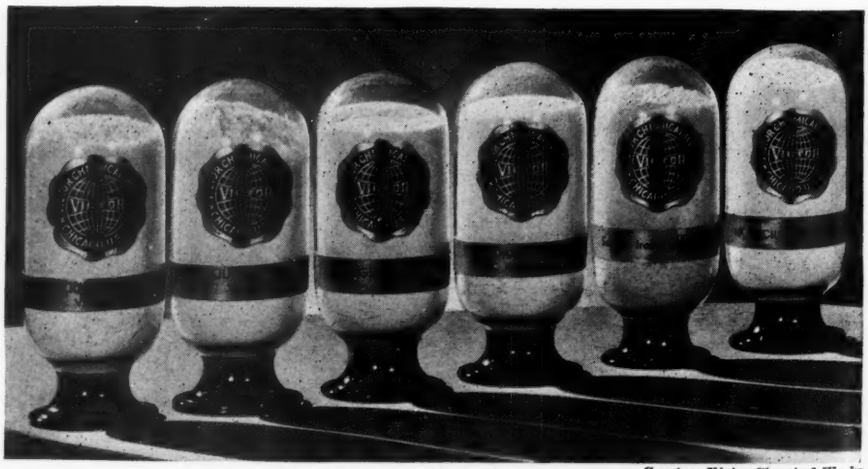
4. Equipment problems:
   - What forms of equipment are available on market.
   - What needs to be purchased.
   - What accessory equipment is needed.
     - Vacuum pumps.
     - Piping.
     - Automatic control instruments.
     - Motors.
     - Conveyors or chutes.
     - Packaging equipment.

5. Operating problems:
   - Material accounting in the plant.
   - Can present personnel supervise?
   - Tests to be made by operating personnel.
   - Relation to control laboratory.
   - Who is responsible in plant.
   - Sequence of production on a single line, regular *vs.* vitaminized.
   - Special labels and packages.

6. Control-laboratory problems:
   - Is present personnel adequately trained for this work?
   - Is laboratory adequately equipped?
   - Can present personnel take on the added work?
   - How often take samples for analysis.
   - What size and kind of samples.
   - Relation with independent laboratories.
   - Responsibility of laboratory.
   - Relation of laboratory to sales promotion claims.

7. Patent problems:
   - What patents are in existence in field.
   - Who owns them.
   - What they cover.
   - How much royalty payable.
   - Are licenses exclusive or not?
   - Responsibility of licensee in patent litigation.

8. Management problems:
   - Shall entire production be vitaminized?



*Courtesy Victor Chemical Works*

**Minerals now being used in the enrichment of processed foods. They are, left to right, tri-calcium phosphate, di-calcium phosphate, calcium acid phosphate, anhydrous di-sodium phosphate, sodium iron pyrophosphate and "hicalcium" phosphate.**

If not, will separate production equipment be needed?
If latter, will it pay for itself or be a loss?
Market research.
Sales policy for vitaminized line.
Relation with control boards.
Relation with food control officials.
Relation with independent laboratories.
Relation with sources of supplies.
Relation with licensors of patents.
Possible obsolescence of methods due to new processes.

# Foods Deserving Attention

**Few products immune from consideration or actual improvement by better processing or addititon of vitamins**

FROM the viewpoint of possible vitamin control there are relatively few foods, aside from canned foods, meat products, condiments and spices, that are immune from consideration or actual improvement. The latter are of two sorts: Improved processing methods that conserve the original vitamin content, or plain enrichment by adding vitamins.

After conferring with many well-informed food technologists who have given much thought to vitamin quality control, the following list has been prepared. It includes only those foods that are subjects for vitamin improvement.

Of canned foods it is said that Federal definitions and standards of identity for fruits and vegetables fail to mention added vitamins as optional ingredients; which, it is claimed, would exempt them from enrichment. One should note in passing that further research may yet uncover ways of improving their preparation and processing to conserve nutritional factors the existence of which may not yet be suspected. It is possible that the period between harvesting and processing, short as it is, may need to be further shortened. And it is also possible that the steam or hot-water precooking, called blanching, may be susceptible to improvement from the food-factor angle.

For the benefit of those to whom the idea is repellent that their pet food is on this list, let it be said that its presence is not an indictment of anything. What it means is that in its commercially processed form its vitamins can be better conserved, or that there exists an active or latent discussion of a possible need for enriching it with vitamins or minerals.

*Courtesy Merck & Co., Inc.*

**Chemist in Merck research laboratories examining ampules in vitamin stability tests.**

**Foods To Be Considered From Viewpoint of Vitamin Control**

| | |
|---|---|
| Butter | Breakfast foods |
| Margarine | Beer |
| Vegetable oils | Malt tonics |
| Prepared shortenings | Wine |
| Lard | Carbonated beverages |
| Milk | Carbonated water |
| Ice cream | Fruit juices, canned |
| Dried milk | Vegetable juices, canned |
| Evaporated milk | Frozen fruits |
| Flour | Frozen vegetables |
| Bread | Dried fruits |
| Biscuits | Dried vegetables |
| Cakes | Sugars |
| Cookies | Confectionery |
| Crackers | Yeast |
| Macaroni | Special dietary foods |
| Noodles | Infant foods |
| Spaghetti | |

# How to Add and Control Vitamin A in Margarine

**Much advance preparation necessary—Supply of enrichment material must be studied—Operating and control procedures have to be set up**

By H. W. VAHLTEICH, *The Best Foods, Inc., Bayonne, N. J.*

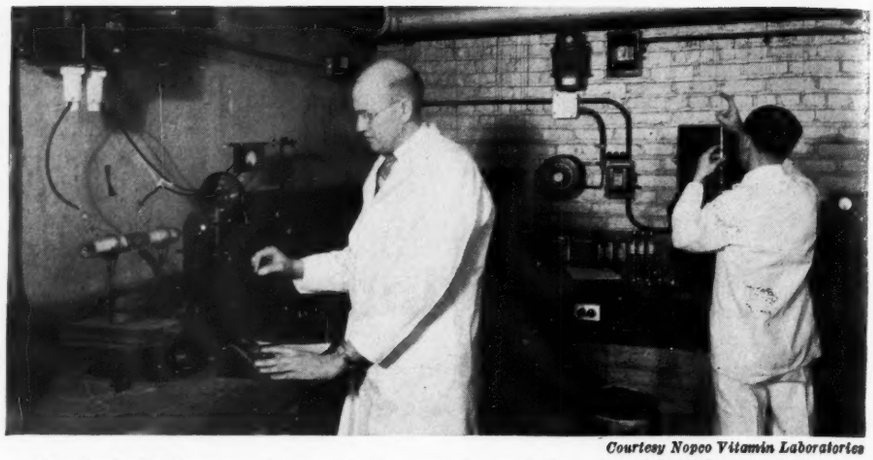
AT the recent annual meeting of the American Institute of Nutrition in Chicago, a speaker cited the trilogy "Inspiration, Information, Application" as pertinent to successful nutritional education. It is also pertinent in vitaminizing food products, although in a somewhat different sense as it pertains to the subject of our problem. From a control standpoint it may be well, though by no means necessary, to appreciate the inspiration or desire to vitaminize. Hence it is not necessary to discuss here one of the most important problems involved in vitaminizing margarine, that of the level at which to add vitamin A. It might be well, however, to add a brief word as to the relative level of vitamin D to be used. This may well be based on a definite ratio to the vitamin A unitage decided upon. The scientific literature generally indicates that butters contain one unit of vitamin D to from 40 to 100 units of vitamin A. Hence a ratio of 50:1 vitamin A units to vitamin D units would seem to be a reasonable one.

### *Dependability of Supply Vital*

Naturally, the most fundamental principle involved in adding a vitamin supplement to a food product is that of the absolute dependability and the responsibility of the manufacturer to the consumer. This involves administrative policy, to be sure, but it is also crucial in control. It leads, further, to a variety of

important details. Thus it calls for a thorough study of the availability of enrichment supplies over a period of years in advance. In the case of most vitamins, and in particular as to vitamin A, it calls for close contact between the laboratory and the purchaser of supplies. Again, it is necessary, not only in aiding the purchaser, but also in guaranteeing the consumer a uniform vitamin level, that dependable manufacturing control methods be set up. In the case of vitamin A, the U.S.P. XI bio-assay method is the only one official in this country, but one cannot rely upon it alone for manufacturing control because it is too time consuming.

Another step of importance, after adequate methods (and personnel to carry them out) have been set up, is the application of the methods to actual plant operations, the determination of a satisfactory margin of safety between the unitage added and the unitage to be declared, and similar practical considerations. Still another point to be settled is the general relation of the laboratory control to plant control. It is hardlly wise to consider the laboratory control of a vitamin supplement as adequate by itself. The plant operators must thoroughly understand their own responsibilities and, whenever possible, the laboratory problems of control as well. Another pertinent detail includes the assignment to one or more independent bio-assay laboratories of purchasing the product at retail and submitting it to the U.S.P. bio-testing technic. This is desirable not only because this bio-testing method for vitamin A is the only one official in the United States, but also, because: (1) Any vitamin addition is expected to give a biological response, and the consumer should have some independent evidence of this; and (2) it is just good sense to have a double check on your own control methods.



*Courtesy Nopco Vitamin Laboratories*

**Biophysical laboratory in spectrophotometric work for vitamin A determination.**

### *Lengthy Advance Preparation*

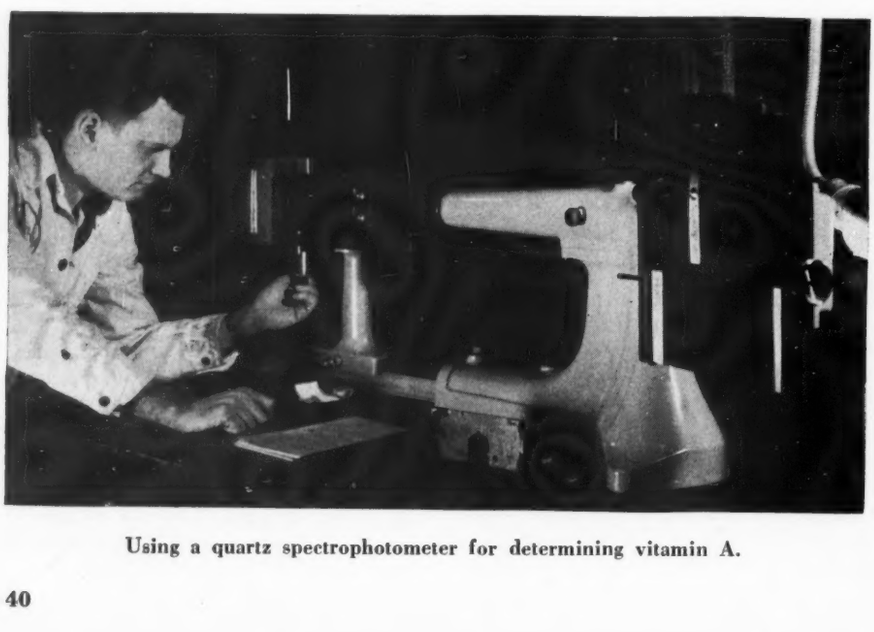
From all of the foregoing, it becomes evident that this is a time-consuming program. Hence, it is essential in preparing to vitaminize margarine to give oneself plenty of time. Even with the very considerable previous experience of our laboratory organization in the details of this work, several years of probing into innumerable further details were taken before our company officials were advised that we were ready to go ahead as far as control and manufacture were concerned. With these details now quite generally known and having been in use for several years, and with suppliers of vitamin A having organized themselves to meet the margarine industry's requirements, it would seem that from 6 to 18 months advance notice should be given to a control organization to prepare itself properly.

Now, in considering methods and operating details it becomes evident that one should not rely alone on any bio-testing technic, such as that of the U.S.P. XI, for day-to-day manufacturing control, because one to two months—and even more —may be required to make such a test. There must, therefore, be available, in addition to the bio-testing procedure, more rapid and reliable day-to-day control tests.

For these latter we have gained confidence from experience in the spectrophotometric determination of vitamin A for quantitative control in the laboratory and use the Carr-Price test for a qualitative or roughly quantitative check in the plant. The first control step is to have U.S.P. bio-tests made of the vitamin A enriching oil to be used to determine its potency. Also, a spectrophotometric determination of the vitamin A enriching oil is made.* This having been done and the amount required per pound of finished product also having been decided upon, the amount of enriching oil required for addition to the margarine oil is readily calculated.

### *Operating Procedure*

The first operating detail to be considered is the perfectly uniform distribution of the vitamin A enriching oil in the margarine oil. It is well known, of course, that vitamin A is oil-soluble and, therefore, the vitamin A enriching oil is introduced into the product by dissolving it in the margarine oil before churning. The means used for determining the perfect solution and distribution of the vitamin A added is the spectrophotometric determination. Once the time of agitation required for perfect distribution is established by experience, and a margin of safety provided for, the samples of margarine oil so enriched with vitamin A may be submitted to the laboratory daily, along with samples of the same oil before the addition of vitamin A for the quantitative control of vitamin A. Similarly, it is possible to determine the vitamin A content of a finished margarine provided another sample of margarine made with



**Using a quartz spectrophotometer for determining vitamin A.**

* The quartz spectrophotometer (we use a Hilger, Intermediate model) requires care in housing and, of course, must be set up with adequate darkroom facilities and enlarging equipment available.

the same ingredients but containing no vitamin A is available.

The accuracy of the quartz spectrophotometer is assured by (1) basing the instrument on the U.S.P. XI Standard of Reference Cod Liver Oil, and (2) using the biological test on the vitamin A enriching oil as a control. Since it is advisable to purchase advance supplies of vitamin A enriching oil, the spectrophotometric control also serves as an additional check just prior to use in margarine at any later date of other portions of the same lot of oil.

While the spectrophotometer control is accurate and quantitative, we do not feel that it or any other single control method is adequate by itself. There should be set up a well-organized system involving a number of checks to make certain that a uniform vitamin supplement is always added. This involves sharing the responsibility with the plant operators and providing them with a check test for assuring themselves of the presence of the supplement in each lot of oil treated. This is a place for the application of the Carr-Price test.

Also, the plant operators may well be responsible for supplying the laboratory with the samples of margarine oil before and after the addition of the vitamin A enriching oil. As already indicated, we feel that a still further check is desirable to be absolutely certain of our own label declaration as to vitamin A potency as well as serving as an additional convincing argument to the interested consumer. This can be done by means of random biological tests for vitamin A made by several independent laboratories continually using the U.S.P. XI technic for vitamin A. As a regular procedure, we authorize several such laboratories throughout the United States to make retail purchases of our product at random for the purpose of feeding the margarine at the level indicated by the label declaration.

Reviewing the control procedure then, the various steps are essentially as follows:

1. Determination of the vitamin A potency of the vitamin A enriching oil to be used in margarine by the U.S.P. XI bioassay technic.
2. Checking the vitamin A potency of the enriching oil with the quartz spectrophotometer based on the U.S.P. XI Standard of Reference Cod Liver Oil.
3. Determination of the presence of vitamin A in the margarine oil by the Carr-Price test (qualitative).
4. Determination of the presence of vitamin A in the margarine oil by the quartz spectrophotometer (quantitative).
5. Having the finished product checked by independent laboratories thoroughly familiar with the U.S.P. XI bio-testing procedure.

To summarize, we would say that the control of vitamin A enriched margarine calls for the use of a combination of methods for the determination of vitamin A as checks and double checks, as well as for the coordination of the steps carried out by the plant, by the control laboratory and by bio-testing laboratories.

# How to Add Vitamin D Concentrate and Control Vitamin D in Milk

**Three controls—of the potency of the concentrate, of its addition to the milk and of the potency of the finished product — assure satisfactory results**

By C. I. POST, *General Sales Manager, Vitamin Divisions, National Oil Products Co., Harrison, N. J.*

THIS subject falls naturally into three phases: (1) Control of the vitamin D potency of the concentrate, (2) control of the physical addition of the concentrate to the milk, and (3) control of the potency of the finished vitamin D milk.

Development of these controls has been the result of the combined thinking and efforts of leading manufacturers of vitamin D concentrates, milk control officials and the fluid milk industry itself, and is representative of the best practice.

### *Control of Vitamin D Potency of Concentrate*

The manufacturer of the concentrate must make certain, through thorough check assays in his own laboratory, that the potency of the concentrate which he sells to the milk industry is as claimed on the label, plus a reasonable safety factor. Copies of these assay reports are made available to local and state milk control officials as proof that the concentrate used by the dairies under their jurisdiction is of the proper potency. This phase of the control is the simplest of all, since the experienced vitamin concentrate manufacturer has ample facilities for controlling this step.

C. I. POST

### *Control of Physical Addition Of Concentrate to Milk*

Vitamin D concentrate should be supplied to the milk plant in sterile containers, and is most widely supplied with the vitamin D emulsified in cream or other milk constituents, and sealed in sterile form in cans similar to those used for evaporated milk. Proper handling of these cans and the addition of the contents to the milk is of extreme importance, and if properly done, it follows that the correct potency of the resulting vitamin D milk is automatically achieved.

Vitex Laboratories (the division of National Oil Products Co., Inc., that handles vitamin D concentrate used by the milk industry) supplies to each of its consumers measuring cylinders that are graduated in terms of quarts. For instance, if a milk plant wishes to produce 500 qt. of vitamin D milk on a given day, it simply fills the cylinder with the concentrate up to the 500 qt. mark in order to obtain the proper amount for this amount of milk. Consumers are also supplied with an instruction chart to be tacked on the wall at a convenient place in every bottling plant using our concentrate. These instructions are as follows:

### *Storage*

Keep unopened and partly used cans in cool place between 45 and 50 deg. F. *Never store "Vitex" below 40 deg.* as freezing causes separation of butterfat just as it would in other milk products.

### *Measuring and Mixing*

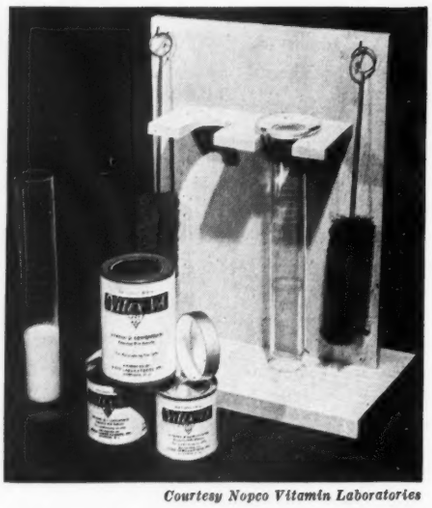
Clean top of can carefully, and with a sterile instrument punch two holes at opposite points. Do not remove top of can unless full can is to be used at one time. Graduation marks on measuring cylinder show the amount of "Vitex" to be added to the different amounts (in quarts) of milk for 400 vitamin D units (U.S.P.) per quart. Milk to which "Vitex" is to be added must be accurately measured. Pour correct amount of "Vitex" into cylinder, then transfer this amount to a clean quart milk bottle. Rinse cylinder with small portions of milk, adding them to the bottle, repeating after each measurement of "Vitex" if more than one portion is used. If full can is used, rinse can in same manner as cylinder. Add more milk until bottle is three-fourths full. Cap and mix well. Do not shake violently causing too much foam. Pour contents of the bottle into the entire batch of milk before pasteurization, again rinsing bottle with plain milk. Then proceed with pasteurization as usual. Carefully cover the partly used can with the aluminum cover provided and store as indicated above.

### *Precautions*

1. Handle "Vitex" the same as fresh cream to keep it from spoiling. No preservative is used. Sterilization keeps it fresh until can is opened and sterile handling thereafter will keep it fresh until contents of can have been consumed.

2. Carefully weigh or measure the milk. Carefully measure "Vitex," thoroughly rinsing and draining the graduate.

3. Thoroughly agitate milk and concentrate in tank.



*Courtesy Nopco Vitamin Laboratories*

**Equipment used by dairies for introducing a vitamin D concentrate into milk.**

*Courtesy Sheffield Farms Co.*

**Measuring out vitamin D concentrate prior to addition to milk in a dairy plant. The can contains 400 c.c. of the concentrate emulsified with butterfat. It is made by Vitex Laboratories, Inc.**

*Courtesy Nopco Vitamin Laboratories*

**Adding vitamin D concentrate to milk before pasteurization.**

4. Before bottling vitamin D milk, be sure system is free of milk which may have preceded the vitamin D milk. Be sure you finish bottling vitamin D milk before running plain milk through the system. This will avoid dilution and eliminate low assays.

5. Be sure that plain milk which may have preceded the vitamin D milk is not frozen on cooler coils. When previously frozen milk melts into vitamin D milk, it causes dilution.

6. If unhomogenized vitamin D milk collects in considerable quantity in cooler troughs or surge tanks between filler and cooler, see that it is well stirred before bottling.

7. Remember each and every quart bottle of "Vitex" vitamin D milk must contain the required 400 U.S.P. units of vitamin D.

8. Sterile handling of "Vitex" is most important. Wipe lip of can with sterilized cloth before and after each use. Wash and sterilize measuring cylinder before and after each use. Sterilize aluminum cover and replace on can after each use.

9. Record the amount of milk and concentrate used daily so that you may have these figures for your monthly production report.

### *Control of Potency Of Finished Vitamin D Milk*

If the first two steps above are properly carried out, the milk distributor can face phase No. 3 with a clear conscience. The consumer, however, is entitled to know that the vitamin D milk which he buys contains the unitage claimed on the bottle cap.

Because of the expense of vitamin D assays, it is obviously uneconomical to perform one daily on the vitamin D milk output of each distributor. Local or state laws, where they apply, require a minimum of three surprise assays per distributor per year. This is also the minimum requirement of The Council on Foods of the American Medical Association for vitamin D milks which are accepted by it.

With this system, the distributor never knows when the samples are going to be picked up, for they are taken either by a local milk control official or by a Western Union messenger, and shipped to any one of a number of independent laboratories scattered throughout the country which are well equipped to do assay work on vitamin D milk.

Reports of these assays are made available to the milk distributor and the local control officer. The cost of these assays is borne by the milk distributor except in Connecticut, where the cost is borne by the state, and all samples are

picked up by the state and assayed in their own laboratories.

In addition to this assay control of the finished milk, each milk plant producing the milk should be required to supply monthly statistical reports showing the total quarts of vitamin D milk produced and the total amount of vitamin D concentrate used. Vitex Laboratories requires such reports from its licensees and it can be easily determined whether the proper amount of concentrate was used to bring about the claimed vitamin potency per quart in the amount of milk produced.

# Irradiation and Control Of Vitamin D in Milk

**Technology of irradiation, practices, equipment, control apparatus, varying factors, effects on product, assays and patents**

By K. G. WECKEL, *Department of Dairy Industry, University of Wisconsin, Madison, Wis.*

THE amount of vitamin D occurring naturally in milk averages between 20 and 30 U.S.P. units per quart. Optimum potency desired is estimated to be between 135–400 units per quart. Therefore, the increase desired in an irradiated milk product is between 6 and 16 times the natural content.

Probably there are several forms of vitamin D occurring in milk. Two of these are believed to be activated ergosterol (vitamin $D_2$, and activated 7-dehydrocholesterol (vitamin $D_3$). The former is derived from insolated forage, whereas the latter originates probably by the action of solar radiation on the cholesterol of the animal skin tissue, whence it is transported to the mammary gland. Two additional forms, activated 22-dihydrocalciferol ($D_4$) and 7-dehydrositosterol ($D_5$), are suggested as being present in milk by way of absorption from ingested insolated forage.

The increase in vitamin D in milk exposed to ultraviolet radiation is due to the action of the radiation on certain substances in milk, believed to be principally cholesterol (7-dehydrocholesterol). This substance is transformed into activated 7-dehydrocholesterol ($D_3$).

### *Irradiation*

The process of irradiating milk consists in exposing milk in thin films to radiation of wavelengths of from 2300 to 3100 Angstrom units. Factors which affect the response of milk to radiation are: (1) Characteristics of the film (thickness and velocity); (2) characteristics of the radiation (intensity and composition); (3) concentration of activatable substances and opacity of the milk to radiation; (4) mechanical principles (film capacity, film dimensions, distance from source of radiation, intensity and incidence of radiation).

K. G. WECKEL

The method of creating the films in commercial installations consist of flowing milk by gravity over vertical, or nearly vertical, smooth or undulating, plane or cylindrical surfaces; or of passing the milk by pressure through slotted orifices where it is exposed to the radiation. These units may consist of either horizontal or vertical tubes, as used in tubular milk coolers, cylinders of some 20-in. diameter, or opposed straight-sided surfaces. A number of experimental modifications of these technics have been employed.

The flow capacity of the films normally used ranges from 350 to 1,000 lb. per linear foot per hour. The thickness of such films ranges from 0.04 to 0.06 cm. The velocity of surface fractions of films flowing by gravity becomes greater when the capacity is increased. The duration of exposure of a portion of a film, the velocity of which is increased, therefore decreases. An average total time of exposure of milk films to the radiation in various types of commercial milk irradiators has been estimated to range from 0.56 to 5.8 seconds.

### *Types of Irradiators*

Mechanical units designed for the irradiation of milk consist of: Milk delivery pump, constant-level float-valve ballast tank, irradiator, discharge pump, electrical control circuit including recording meters, and sanitary piping. The milk pumps are unnecessary in gravity-flow systems. Four types of milk irradiators are self-enclosed (National Carbon Co., Hanovia Chemical and Manufacturing Co., R. U. V. Co., and Creamery Package Manufacturing Co.) and require no added protection for employees. Other types, such as a surface cooler with an adapted lamp, require a separate room for operation to prevent injury to employees by the reflected radiation. The enclosed units are made of stainless steel, and have completely demountable and approved sanitary type of construction. The electrical circuits designed for the units are entirely automatic, and require only toggle switch manipulation by employees. Periodic maintenance examination is required for the lamp and control circuit mechanism.

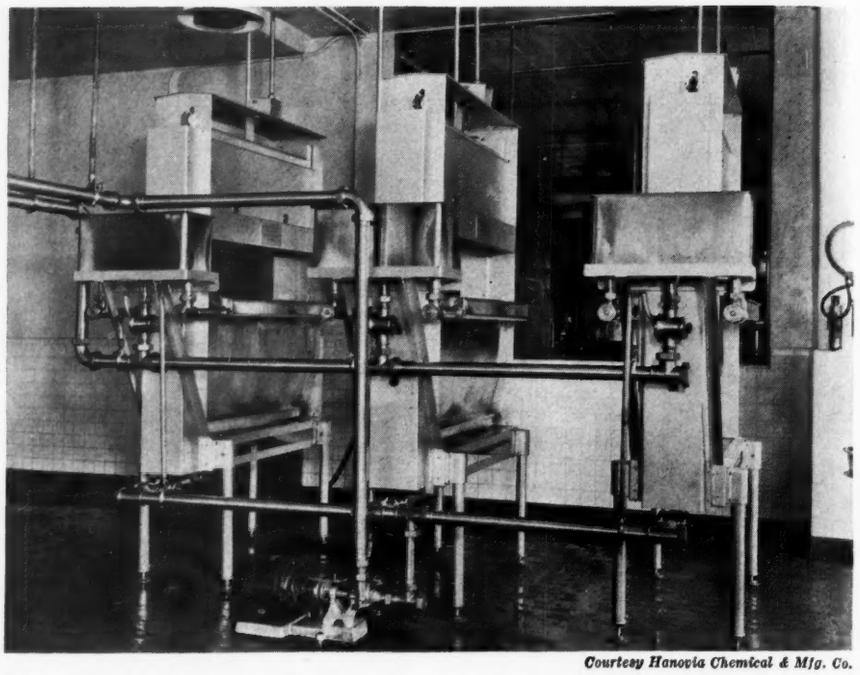
Radiation employed for the process of activating milk is derived from one of two sources: (1) The carbon electrode arc, or (2) the quartz mercury-vapor arc. The carbon arc refers specifically to the luminous flame established between two electrodes when a current passes between them. The electrodes of the carbon arc used for irradiating milk consist of

tubes of carbon with cores consisting of carbon impregnated with metals and are several in number. The poly-metallic electrodes now used for the irradiation of milk are the types *C, U,* and *W* of National Carbon Co. A carbon arc during operation emits gaseous products of combustion which are conveniently removed by means of forced ventilation. During operation the carbon arc also discharges nonvolatilized carbon and metallic residues which drop away from the flame. A lamp, in which the ignited carbons are operated, consists of movable power-driven electrode holders which, by an indirect control circuit, automatically space the carbons during their disintegration. This automatic spacing maintains a uniform power application and radiant energy emission. The emission of radiation from the carbon arc is maximum within a period of seconds after the electrodes are ignited. Circuits are now in use having an arc generated between two electrodes (single phase, 6.5 kw.) or between six electrodes (three phase, 12 kw.). The carbon arcs operate independently of external temperature fluctuations, but require uniform motion of air used in their ventilation. The intensity of radiation from the carbon arc is affected by variation in applied electrical power.

The quartz, mercury-vapor arcs now used commercially for the irradiation of milk are characterized as hot high-pressure arcs. These consist of tubular transparent fused quartz, containing very small quantities of mercury which vaporize when the arc is established. A period of several minutes elapses between the time the burners are first ignited and the radiation discharge reaches the operating maximum. The radiation emission from the quartz, mercury-vapor arc is affected by power fluctuation, external temperature fluctuation and loss in transmissivity of the fused quartz envelope which diminishes with usage. Natural-draft ventilation is utilized to remove the heat generated by the lamp.

Manufacturers of carbon electrodes insure uniformity in their product by examination procedures. These include color code and letter marking of the carbons, x-ray examination for flaws, inspection for minimum warp, uniformity of burn, intensity and longevity. In use, the most likely variable in the operation of the carbon arc is the power supply. For that reason, regulatory circuits have been designed to meet these conditions. The uniformity of power utilization is conveniently measured by means of a recording wattmeter and indicating voltmeter and ammeter.

Manufacturers of quartz mercury-vapor lamps subject the lamps to measurement of vacuum and intensity of radiation, and to short trial test operation periods. Finally, they identify their lamps by a seal number. Since intensity of radiation from the quartz mercury-vapor lamp is affected by less controllable factors, a fixed power input does not necessarily provide a definite radiation intensity. It is necessary to vary the power input to compensate for such factors as changes in temperature and decreased transmission by the quartz during its operating life, which may range from 2,000 to 3,000 hours. This is conveniently accomplished by passing radiation from the lamp to a photocell which actuates a circuit regulating the power necessary to establish the desired intensity. The uniformity of intensity is conveniently recorded on a microwatt meter.



*Courtesy Hanovia Chemical & Mfg. Co.*

**Three of the eight milk irradiators in the Riverside plant of Borden's Farm Products, in New York City. This plant processes daily more than 50,000 lb. of 400-unit vitamin D milk. These high-capacity ultraviolet units are automatically controlled. They are constructed of stainless steel. Hanovia Chemical & Mfg. Co. manufactured the machines.**

### *Factors Affecting Irradiation*

Occasionally the emission of radiation from ultraviolet lamps is less than desired, principally because of poor power supply. Examples of practices that create such a condition are: (*a*) Change in plant peak load intervals to periods when the milk irradiator is in operation, (*b*) installation of other, new and frequently heavier, equipment, (*c*) utilization of increasingly greater power loads by other concerns on the power line and (*d*) inadequacy of manually operated "power boards" in the plant. These conditions are readily ascertained by periodic voltage measurements. In addition, chemical tests (decomposition of reagents by radiation) and portable photocell intensity meter measurements may be used to augment the significance of power records. While in many operations variability in power affects only speed of operations and economy of power use, in the irradiation of milk it affects immediately the intensity of radiation applicable to the film of milk.

The effect of radiation on a film of milk is determined to a degree by the dimensional factors of the film, such as surface area and distance from the source of radiation. Unless alterations in the equipment are made, the dimensional factors of commercial milk irradiators are fixed. However, milk distribution areas (film areas) may be changed if orifices are inadvertently blocked by particles from objects such as metal chore boys and bristle brushes.

Variation in the flow volume capacity of milk passed through a milk irradiator will affect the amount of vitamin D created. The flow volume may be affected by a number of factors, such as change in temperature and viscosity of the fluid, fluctuation in hydrostatic head in vats from which milk is pumped, change in friction load by increased discharge-line sanitary piping, shrinkage or wearing of pump belting, and variation in power supplied to the pump. Positive feed, rather than centrifugal pumps, eliminates some of the variables which might occur were operations left to an individual's supervision. Positive-feed milk pumps having variable drives are equipped with a sta-

tioning pin which may be sealed in place with a lead sealing wire by the supervising health officer. More recently designed milk irradiators are equipped with constant level supply tanks (float-valve operated) from which the milk flows through orifices to the irradiator. The rate of flow is governed by the size of the orifices.

Flow capacity determinations are best made by weighing the discharge of milk from the irradiator collected for a definite interval. Error may be introduced through failure to recognize that discharge piping from an irradiator, through frictional forces, causes a "backing up" of milk in the collecting trough of the irradiator. Unless the accumulated milk is just withdrawn when the discharge line is disconnected for the test, accurate sampling cannot be done. Measuring the discharge of milk withdrawn from the collecting trough of an irradiator by a centrifugal pump that "surges" is likewise obviously improper. When flow rate capacities are determined for very short intervals of sampling, errors are magnified when the data are converted to an hourly basis. These practices are more prevalent when the testing of flow volume is relegated to uninstructed employees. Data of flow capacities of irradiators may be conveniently determined by computation from the total discharge over a period of time, providing the interval of operation has been sufficiently long.

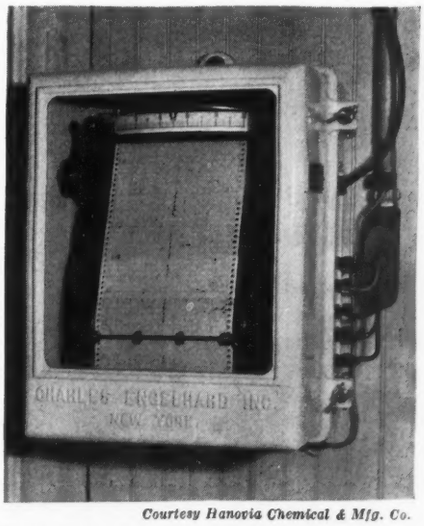
Normally, the variations which occur naturally in the fat content of milk from day to day do not affect measurably the response of milk to radiation. Experimentally, it has been shown that significant increases in fat content of milk result in an increase (not proportionate) of the vitamin D content of the milk. Even milk containing very little butterfat may acquire some vitamin D when properly irradiated. The major portion of the precursor of vitamin D is associated with the fat fraction of milk. Some of the activatable substance is associated with the proteinaceous fraction of milk. While it seems not to have been demonstrated experimentally, experience has indicated that there is probably a slight decrease in the activatable substance in milk during the winter season. It is during this period, too, when the natural preformed vitamin D content of milk is at its lowest. During this period careful attention must be given irradiator operation to attain uniformity and the desired results.

### *Modified Milk Products Irradiated*

A number of modified milk products may be successfully irradiated. Among these may be cited milk of normal or reduced fat content, cream, evaporated milk, milk powder and ice cream mix. Only a few of these, such as milk, evaporated milk and milk for milk powder are made commercially available. The indiscriminate vitamin D fortification of milk products has not been considered proper for sound nutritional reasons. The carrier of vitamin D should consist of a regularly consumed product to provide satisfactory prophylactic value. While the application of the process of irradiation for the various milk products is similar, the conditions which must prevail for each type of product are quite specific.

*Courtesy National Carbon Co.*

**Ultraviolet irradiator for producing vitamin D in milk. It is made by National Carbon Co.**




*Courtesy Hanovia Chemical & Mfg. Co.*

**Recording ultraviolet meter for irradiation units. To this instrument is connected a photoelectric cell located in the top of the irradiator, this cell being sensitive only to ultraviolet radiation. The cell generates electrical impulses which, through a regulating mechanism, correct for variations in light intensity due to voltage variations or to the condition of the lamp.**

It is technically possible to irradiate fluid whole milk at almost any stage from the time of its production until filled into the bottle. Usually milk is irradiated just prior to its pasteurization while it is being drawn from storage through the irradiator to the pasteurizer. When milk is to be homogenized, a common plan is to irradiate the milk while cold prior to heating it for passage through the homogenizer from which it goes to the pasteurizer. In some installations the process of cooling and irradiation after pasteurization have been combined in one step. In these instances the cooler serves as a surface on which the milk is irradiated.

Evaporated milk is usually irradiated while hot when drawn from the vacuum pan and prior to being cooled for storage. This practice is generally carried out for reasons of convenience as well as economy.

The flow capacities of a given irradiating unit for evaporated milk are significantly better than half the capacity possible for fluid whole milk (unevaporated). In a few instances, evaporated milk is irradiated while cold just prior to being filled into cans. Because variations in temperature, processing history and composition affect the physical properties of evaporated milk markedly, operating conditions for a milk irradiator will vary where different milk processing methods are used.

The vitamin D of natural or fortified milk products is quite stable. It is stable at the ordinary pasteurization temperature of 62.8 deg. C. for 30 minutes, or sterilization at 115.6 deg. C. for 15 minutes as employed for evaporated milk. The form vitamin $D_2$ in a moist state has been reported unstable at higher temperatures such as 232 to 260 deg. C. for periods of five minutes. Both the naturally occurring and induced forms of vitamin D are stable during long periods of storage (three years) in products such as butter and evaporated milk.

### *Determining Vitamin D*

As for other vitamin D food products, no acceptable rapid technic has been developed for the estimation of vitamin D in milk or milk products. The official method makes use of animal bio-assays, requiring some three weeks for the preparation of animals and a period of ten days feeding of the products being examined. Because of the expense of conducting such tests, and the necessity for employing trained personnel, only a limited number of laboratories provide bio-assay service for vitamin D measurement of foods for public service. For example, the only city-maintained vita-

min D testing laboratory is that of New York City, and the only officially designated state laboratories are those of Connecticut and Virginia. Elsewhere, the service is provided for food regulatory divisions of city health departments by arrangement with laboratories such as at Michigan State College, Ohio State University at Wooster, Rutgers and private laboratories such as the Wisconsin Alumni Research Foundation and the Fleischmann Co.

Because of the expense of conducting a bio-assay for vitamin D, the tests made upon the product of a given plant are infrequent and vary from monthly to quarterly periods. Under these circumstances, regulatory officials rely principally upon the significance of clauses pertaining to labeling, unannounced sampling and other sampling technics. The inspection of equipment and recording charts has proven satisfactory by Public Health Supervisory Control. Because of the lack of convenient and inexpensive antirachitic-potency-test technics for appraising the value of the milk, the operators of the equipment must pay strict attention to the details of operation. Experience has shown, however, that an adequately fortified product is consistently produced by irradiators given normal supervision.

Evidence of any significant destructive effects of irradiation on the other vitamins in milk is wanting. Vitamin A, thiamin and riboflavin have been shown to be unaffected by the commercial methods of irradiating milk. Evidence of possible slight effect on ascorbic acid has not been clearly defined. Milk which is *unduly* exposed to radiation from either an ultraviolet arc or sunshine will acquire what is known as a "sunshine" or "activated" flavor. In the operation of milk irradiators, attention given to proper distribution of the film and the necessity of extinguishing the arc when the flow of milk has ceased avoid the defect. The flavor of milk properly irradiated so as to acquire the desired antirachitic potency is unaltered by the process.

### *Patents*

At the present time there are a number of patents extant both on the use of radiant energy for the antirachitic activation of foods and on the design and construction of milk irradiators. The process of irradiating milk is governed by the Wisconsin Alumni Research Foundation from whom license may be obtained. The use of equipment for the irradiation of milk is obtained by direct purchase from the manufacturers, who provide an irradiation assembly of all necessary items. The license granted by the Wisconsin Alumni Research Foundation provides for a graduated scale of royalties based upon volume of operations, and which provides for biological examination of the products as well as sales promotion service.

Two significant developments have resulted from research in the process of irradiation of milk during the past eight years. These are the increase in flow capacities of commercial milk irradiators by as much as three-fold, from 4,000 to 15,000 lb. of milk per hour, and the increase, when desired, in the potency of milk from 135 to 400 U.S.P. units per quart. Of practical significance has been design simplification and improvement in sanitary features of construction. At the present time fluid milk, equivalent to some 5,000,000 quarts of milk a day (evaporated milk and fluid bottled milk), is irradiated and distributed. Better than half of the evaporated milk produced in the United States is irradiated. In some of the major cities from 5 to 10 percent of the total fluid milk distribution consists of irradiated vitamin D milk. Utilization of the irradiation process for milk has proven both economically and nutritionally sound even though laboratory control is difficult and expensive.

#### References


1. K. G. Weckel, Vitamin D Milk. A Review, *Journal of Dairy Science*, May, 1941.
2. K. G. Weckel, Vitamin D Content of Dairy Products—Methods of Fortifying Milk, Proceedings of the First Food Conference of the Institute of Food Technologists **1**, 1940, p. 133.
3. K. G. Weckel and H. C. Jackson, The Irradiation of Milk, Wisconsin Agricultural Experiment Station Research *Bulletin* 136, 1939.


# How To Get Vitamin D into Milk By Feeding Cows Yeast

**Feeding irradiated yeast to produce a standardized vitamin D milk is a well-established and accepted method for controlling rickets**

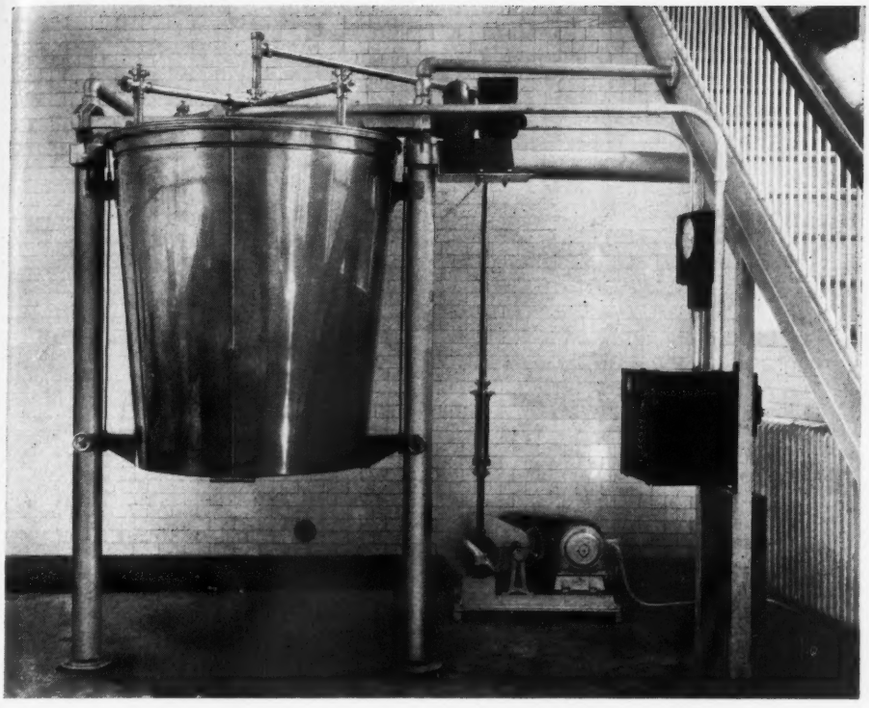

By CHARLES N. FREY, *The Fleischmann Laboratories, Standard Brands, Inc., New York, N. Y.*


VITAMIN D was identified as a definite entity in 1922 by McCollum, the production of vitamin D by irradiation was established in 1924 by Steenbock and Hess, and the subsequent identification in 1927 of ergosterol as a precursor or pro-vitamin of this type of vitamin D, produced by irradiation, was accomplished by Windaus. The presence in yeast of an activatable substance was demonstrated in 1925. The irradiation of yeast was begun on a commercial basis in 1928. The mercury high-pressure lamp was employed initially, and later the carbon arc was also used as a means of activation.

Yeast was one of the first food products to be activated by means of ultraviolet irradiation. Standard Brands was granted an exclusive license to activate irradiated yeast by means of ultraviolet under the Steenbock patents.

CHARLES N. FREY

The first yeast produced commercially had a potency of 300 Steenbock units per gram, equivalent to approximately



**Creamery Package Mfg. Co. irradiator installed in Borden's Farm Products milk plant at Hammond, Ind., showing sealed-capacity milk pumps with control cabinet and recording ammeter.**

810 U.S.P. units. Today yeasts containing 7,200 U.S.P. units per gram are on the market. Commercial cod liver oil, by comparison, ranges from 85 units per gram to 400 U.S.P. units for the fortified product.

The yeast used for the production of irradiated dry yeast was a specially grown pure strain of brewer' type yeast selected for its relatively high content of pro-vitamin D—ergosterol.

Each separate batch of yeast is bio-assayed to make certain that it conforms to the standard set for the particular type desired. Standardization was begun in 1928. The first commercial batches sent to the Walker-Gordon Laboratories for the production of vitamin D milk were carefully standardized as to their vitamin D content. The first vitamin D milk produced at the Walker-Gordon Farms in 1930, by feeding Fleischmann's standardized irradiated yeast, was bio-assayed in order to determine accurately its vitamin D content. On the basis of clinical work undertaken by Dr. Alfred Hess, a noted authority on rickets, it was decided to produce milk at a level of 430 U.S.P. units per quart, and this level has been maintained since the initial experimental work was carried on. At the time the milk was standardized the Steenbock unit was employed.

As the experimental work on feeding yeast to cows developed, tables based on work done at The Fleischmann Laboratories and Walker-Gordon Farms were devised to guide the producer in regulating the amount of yeast fed in relation to the production of the cow in order to maintain a uniform potency. Experimental work indicated that yeast must be fed in proportion to production and not in proportion to butterfat produced. Scientific investigations have shown that the production of so-called "metabolized vitamin D milk" of standardized potency depends upon three simple but fundamental rules:

1. The amount of irradiated yeast to be fed depends upon the milk production of the cow.

2. The high producers are more efficient than the low producers in transferring vitamin D from the ration to the milk.

3. The yeast must be fed two or more times daily rather than at one feeding.

It was shown that if all the yeast were fed at one feeding, there was less economy, as a great deal of the vitamin D was excreted and less of it appeared in the milk.

Whenever it is possible to do so, it is to the advantage of the dairyman to select high producing cows. While it requires more yeast for each individual cow, the cost of yeast per quart of vitamin D milk is less as the production increases.

The following table gives the amount of irradiated yeast to be fed at different levels of vitamin D milk production. The yeast is irradiated to such a degree that when the amounts given in the table are fed milk of the required potency will be obtained.

| Average Daily Milk Production per Cow (Pounds) | Amount of Yeast Required Daily (Average per Cow) (Ounces) |
|---|---|
| Up to 20 | 1¾ |
| 21 to 25 | 2¼ |
| 26 to 30 | 2½ |
| 31 to 35 | 2¾ |
| 36 to 40 | 3 |
| 41 to 45 | 3¼ |
| 46 to 50 | 3½ |
| 51 to 55 | 4 |
| 56 to 60 | 4¼ |

A convenient way of feeding the yeast according to the milk production is by mixing it with the grain concentrate. The grain concentrate is fed in higher amounts to the high producing cows, consequently the irradiated yeast will automatically be fed in higher amounts to those cows which have the highest production. The low producing cows will have a proportionately lower amount of vitamin D.

The milk ordinarily reaches about 80 percent of its maximum vitamin D potency at the end of ten days of yeast feeding and then increases in potency more slowly until a maximum value is attained after about five or ten days more. This point is of considerable importance to the producer, because once his milk has been standardized it is not necessary for him to have it tested at frequent intervals in order to be assured that it has the required potency, for once the maximum potency has been reached the number of units per quart will remain constant.

### *Testing of Vitamin D Milk*

To determine the potency of vitamin D, milk tests are made in the laboratory by feeding it to experimental animals. The amount of vitamin D in any substance is determined by feeding a weighed amount of the substance to rachitic rats and determining the amount of healing that is produced. White rats are used in the determination and the test is usually termed "a bio-assay." The amount of vitamin D is expressed in . . . "units."

The vitamin D unit was originally defined as the amount of vitamin D that will produce a certain degree of healing in a given time under specified conditions. This unit was supplanted by the U.S.P. unit which is based on a preparation of irradiated ergosterol prepared under standard conditions.

The unit of vitamin D is the vitamin D activity of 1 milligram of the international standard solution of irradiated ergosterol, which has been found equal

to that of 0.025 microgram (0.025γ) of crystalline vitamin D.

The actual test period during which the material under examination is fed to the rats is only 10 days, but to get the animals ready for such a test, preparations must be made many weeks in advance. The breeding animals are fed a stock ration that is satisfactory for maintenance of the adults and adequate for the production of healthy offspring. It is sufficiently low in vitamin D content so that there is no appreciable storage of this vitamin in the young animals. The young are weaned when they weigh between 45 to 50 grams, at an age of from 20 to 24 days, and at the time of weaning are placed on the rickets-producing diet known as the Steenbock Ration No. 2965. All litters are reduced to six animals, and families are kept together while on the 2965 ration. Severe rickets develop in 20 to 23 days, at which time the animals are ready for use and the litters are distributed in the feeding groups. The vitamin D may be fed in the form of milk or as butter fat. It has been found that practically all the vitamin D is concentrated in the butterfat.

A period of approximately seven days is required for the animals to eat the food containing the fat, assuming that the fat has been separated from the milk. After the food containing the fat is eaten, the animals are fed the 2965 ration until the end of the test period. At the end of the tenth day all the animals are killed and the tibia from each rat is placed in 10 percent formalin solution (the radius and ulna may also be used). After 18 to 24 hours each tibia is split, stained with a 1 percent nitrate solution, exposed to artificial ultraviolet light and examined to determine how much healing has taken place.

A series of rats is also run as a negative control, that is, a group receiving only the basal ration, and another series or two series may be run on the vitamin D standard. The unknown sample may be fed at two or three levels, depending on the degree of uncertainty regarding the potency of the sample.

The healing of rickets is the result of the deposition of calcium and phosphorus as new, healthy bone, and it occurs near the end of the bone at the so-called epiphyseal margin adjacent to the metaphysis. In the case of the test animals, the newly deposited bone is stained by the silver and appears as a dark line across the bone. The width of the line depends upon the amount of healing that has taken place, and this in turn depends upon the amount of vitamin D in the material which is being tested.

The degree of healing is compared with that produced by a known amount of vitamin D fed to a standard group.

### *Metabolized Vitamin D Milk*

Vitamin D milk produced by yeast feeding is called metabolized vitamin D milk to distinguish it from other types of vitamin D milk. Metabolized milk has been approved by health officers and by the medical men. It has also received the approval of The American Association of Medical Milk Commissions. The Council on Foods of the A.M.A. has also approved the yeast feeding method of producing vitamin D milk. Many individual dairymen who use the method have obtained the Council's seal of approval.

It may be well to point out that vitamin D obtained by the irradiation of ergosterol or by the irradiation of yeast containing ergosterol is equivalent psysiologically to the vitamin D of cod liver oil when given to man or domestic animals, with the exception of chickens. In the case of the chicken, the vitamin D in cod liver oil is far more effective per rat unit than the vitamin D obtained from ergosterol. The importance of vitamin D in the production of farm animals has been but recently appreciated. In a paper recently published by Skelly of the New Jersey Experiment Station, it was found that pigs kept indoors on a ration of corn meal and tankage gave improved growth with a lesser consumption of food when the ration was supplemented with vitamin D. The pigs which did not receive the supplement attained an average weight of only 210 lb. and consumed 466 lb. of feed per 100 lb. of gain, whereas, the pigs which has received the extra vitamin D attained a weight of 292 lb. and consumed only 392 lb. of feed per 100 lb. of gain. Sinclair at the University of Alberta also found that vitamin D is related to economy of gain. From these experiments, we may conclude that it is sound practice and good economy to supplement feeds with vitamin D.

The beneficial effect of feeding irradiated yeast to cows has been observed. A number of milk producers have stated that the cows given irradiated yeast for the production of vitamin D milk have a sleek appearance and good condition, and produce calves which are stronger and more vigorous as compared with calves from cows that do not obtain the yeast. The yeast contains many other factors in addition to vitamin D, but it is believed that vitamin D may enable the cow to rebuild her supply of calcium more quickly during the rest period if adequate supplies of vitamin D are present in the diet during the entire lactation period.

The feeding of irradiated yeast to cows, resulting in the production of a standardized vitamin D milk, is thus a well established and accepted method for the control of rickets. It permits the production of vitamin D milk in the natural way.

# Irradiation and Control Of Vitamin D in Cereals

**While irradiation was the first method used, other forms of vitamin D enrichment for cereals have now come to the fore. Rat tests remain the best method of control.**

By FRANK L. GUNDERSON, *Biochemist, Quaker Oats Co., Chicago, Ill.*

OF all the vitamins, vitamin D, so effective in aiding calcium and phosphorous metabolism, can probably be added to foods by the greatest variety of procedures. Direct irradiation and addition of ultraviolet ray activated yeast, ultraviolet ray activated ergosterol, ultraviolet ray activated cholesterol, low velocity electron activated ergosterol and various fish liver oil concentrates are widely used methods. The preferred method of vitamin D fortification for a particular use will vary from product to product, depending on specific conditions.

To a very large extent, problems in cereal activation through irradiation have their origin in the low penetration of ultraviolet rays into solid materials.

That low penetrating power restricts changes effected by ultraviolet irradiation essentially to the surface portion of kernels, granules or flakes of cereal grains and seeds. Yet, development of vitamin D properties in cereals by irradiation

with ultraviolet rays is dependent upon the presence of a natural, fat-like substance identified chemically as ergosterol which is found in the cellular tissue of vegetable materials. Yeast is one of the richest sources and vitamin D can be extracted from it by solvents. Cereals contain smaller amounts and can become commercial sources of vitamin D when their ergosterol content becomes activated through exposure to ultraviolet rays by one method or another.

In its ordinary natural form ergosterol, regardless of its vegetable source, does not actively aid in the metabolism of calcium and phosphorus but does become very effective after subjection to the photochemical influence of ultraviolet rays.

An important factor in successful irradiation is how to obtain uniform exposure of the maximum amount of cereal surface to ultraviolet rays. One method quite suitable for large-scale operation depends upon spreading the cereal material in a thin layer over the surface of a wide horizontal conveyor belt and passing it at a controlled speed under a battery of ultraviolet sources. The grain may be in either an air-dry or moist condition and the layer must be only one granule in thickness to get best results. Ultraviolet generators usually used are of the mercury-vapor, quartz type and may be of either the so-called "high" or "low" pressure design. Carbon arc lamps might be used when considered on the basis of radiant energy obtainable, but because the arcs form small particles of debris which might become a contaminant, mercury vapor equipment has been found preferable for cereal food use.

Mercury-vapor, quartz, ultraviolet generators such as manufactured by the Electro Therapy Products Corp., and General Electric Co., are suitable for cereal irradiation. Lamps of tubular design and of several feet in length have proved particularly effective. The tubes

FRANK L. GUNDERSON

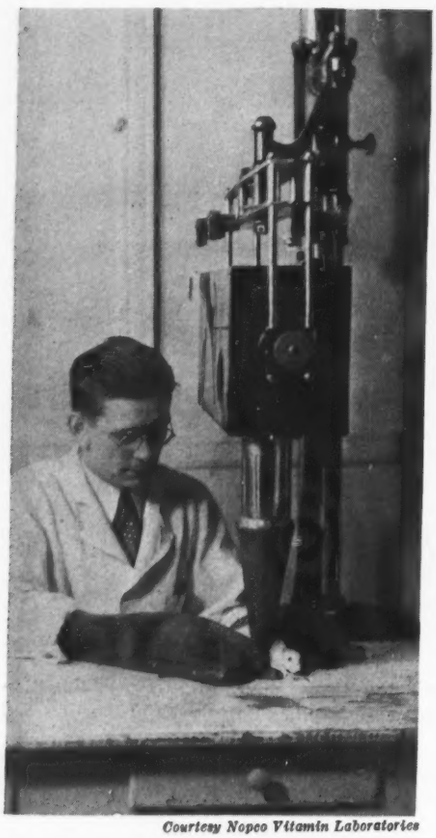
**No chemical or microbiological tests for vitamin D are yet satisfactory. A nutrition laboratory with its test rats is the sole means of exercising control over production and presence of vitamin D in cereals**

are of quartz composition and, for large production purposes, are used in batteries of several dozens in one installation. For best results, they are placed horizontally at right angles to the path of the belt and about 4 in. above the conveyor. A specially constructed housing, also containing the auxiliary electrical equipment, provides a polished metal canopy over the belt and lamp system to concentrate the ultraviolet rays upon the cereal as it passes on the belt at a controlled rate of speed. Exposure to the rays is usually restricted to a fraction of a minute and made as uniform as possible on all surfaces. The particles are mechanically turned over midway in the exposure period.

As can be surmised from the equipment used, irradiation of cereals is expensive from the standpoint of capital investment. In addition to the ultraviolet lamps, auxiliary electric equipment including transformers, conveyor belt with a complete inverted reflector canopy and special housing, previously mentioned, a production installation requires other cereal handling units. They include: (1) Machinery for conveying the cereals to the irradiation room and, after exposure, to the next step in normal processing, (2) feeding rolls with regulating devices to control rate of delivery of cereal to treating conveyor. Operating cost of the equipment is relatively low and confined largely to electric energy and direct labor. Reconditioning and replacement of the quartz tubes run into a sizeable item of expense.

Since the objective of direct irradiation of cereals is to impart mild antirachitic properties without otherwise changing the cereals, and this is done without the addition of any material ingredient, operating conditions during the irradiation must be highly standardized and rigidly controlled. Ordinary mill control laboratory procedure and personnel are not sufficient to check production results. Bio-assays (experimental rat feeding and examination) involving the use of nutritionally trained personnel are required. The control tests for vitamin D production and presence are expensive and take a prolonged period of time. Even an ideally irradiated cereal fed at full strength level in a specially worked out series of feeding tests requires a four to five weeks test period to give conclusive or irrefutable results. As yet, no satisfactory short-cut method has been worked out for testing irradiated cereals. Bio-assays, for all their handicaps with respect to time required and expense involved, do give objective, concise, and conclusive results in showing that irradiated cereals are better antirachitic foods than are non-irradiated cereals.

During the past 15 years, means available for enriching cereals with vitamin D have broadened greatly. Vitamin D yeast has become particularly prominent. Through careful selection and development of yeast for irradiation purposes an irradiated dry yeast powder, with a potency as high as 3,200,000 I.U. per pound, is being produced at the present time.



*Courtesy Nopco Vitamin Laboratories*

X-raying rat bones for vitamin D determination.

In contrast with vitamin $B_1$, nicotinic acid and riboflavin, vitamin D is not usually purchased or handled in the pure form as vitamin D. The cost of producing vitamin D at full concentration, containing 40,000,000 I.U. per gram, (Calciferol), is prohibitive and impractical for most food and pharmaceutical purposes.

Irradiated dry yeast in either finely granular or thoroughly powdered form lends itself very well to direct admixture with cereal materials. In the making of an enriched cereal of the farinaceous type, a cylindrical batch mixer with capacity of 500 to 1,000 lb. and with suitable paddles serves very well. Each batch can be mixed in about five minutes. Rat laboratory control tests serve as a guide to the precision with which this operation is carried out. Since the vitamin D potency of cereals enriched in this manner is higher than that of irradiated cereals, a faster rat-testing technic can be employed to give accurate results within 7 to 10 days.

Wheat or other cereals of the ready-to-serve type may be enriched by the addition of irradiated yeast during one of the late stages in cooking of the grain. A premix of the yeast powder may be made with a small portion of finely ground grain and this fed onto the cooked cereal in a continuous manner with a precisely controllable feeder device. Since the vitamin D is resistant to heat, experiments have shown there is no measurable loss in the final stages of cooking the product. Vitamin D in the form of an oily concentrate can be applied to cereals as a fine emulsion in water which can be sprayed on the cereal either as a one-vitamin spray or in conjunction with other water-soluble or fat-soluble vitamins.

Vitamin D additions can be made to flour on a routine basis. In that case, additions of either irradiated yeast or irradiated ergosterol solution in suitable bland vegetable oil may be made into a flour premix. The premix in turn may be blended with other flour to make the final vitamin D enriched flour.

# How to Conserve Vitamin C in a Liquid

## Elimination of dissolved oxygen and certain oxidizing agents is the key to success

By P. F. SHARP, D. B. HAND and E. S. GUTHRIE, *Department of Dairy Industry, Cornell University, Ithaca, N. Y.*

THE first requisite for the control of any unstable substance is a simple rapid analytical method for its quantitative determination. Fortunately, the determination of vitamin C by titration with iodine or the oxidizing dye 2-6 dichlorphenol-indophenol meets these requirements. Milk, orange and grapefruit juice, as well as the juice from a number of vegetables, can be titrated directly with the dye after simply acidifying. For confirmatory testing the determination can be made more specific by performing the titration before and after adding ascorbic acid oxidase (cucumber juice), in which case the decrease in titration in the presence of an excess of dissolved oxygen represents the vitamin C. The test can be made still more specific by then reducing the oxidized ascorbic acid as well as any dehydroascorbic acid originally present by treating with a washed suspension of a suitable strain of *Escherichia coli* and again titrating.

The vitamin C content of the natural products may show considerable variation in samples taken from limited sources, so it is necessary first to establish a base value for the fresh material in its natural state. For example, fresh milk from individual cows 15 minutes to 1 hour after milking ranges from 7 to 41 mgm. per liter, whereas large vats of mixed milk give values near 22; orange juice, from various varieties, localities and degrees of ripening of the fruit may vary from 0.3 to 0.7 gms. per liter while the average is about 0.5 gms. per liter.

Many products contain ascorbic acid oxidase, which in the presence of dissolved oxygen is capable of oxidizing vitamin C. Crushing plant cells or destroying the semipermeability of their membranes by freezing or limited heating enables the enzyme to oxidize vitamin C if free oxygen is available.

Dissolved copper is an active catalyst for oxidation of vitamin C, particularly if the liquid is low in protein. Therefore, elimination of copper or copper-alloy equipment is desirable.

The oxidation of vitamin C in pure solution is insensitive to acceleration by visible light but, in the presence of riboflavin (another vitamin) and certain dyes which act as photosensitizers, it is oxidized.

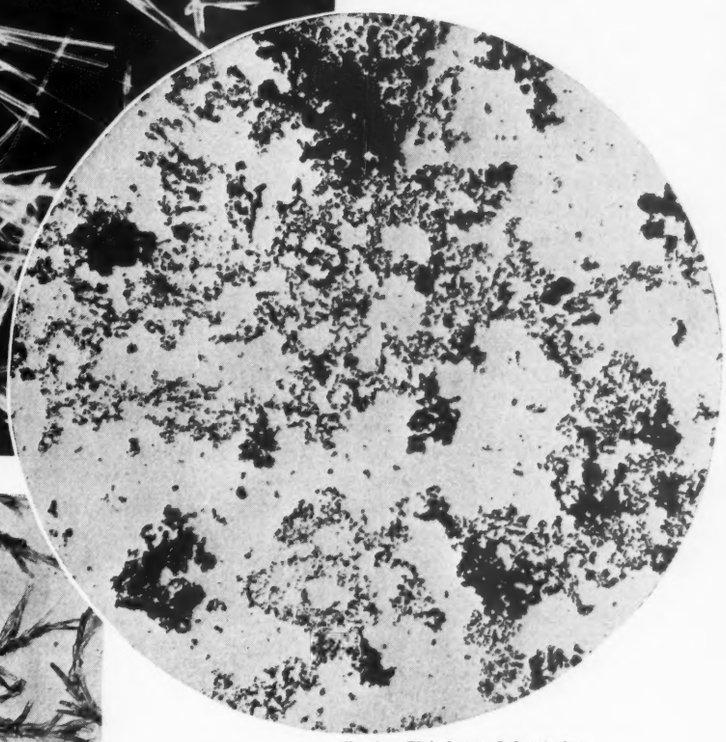
All of these oxidations require dissolved oxygen. Hydrogen peroxide and probably other peroxides will oxidize vitamin C; alkalis will destroy it.

Oxidation catalyzed by copper and enzyme is accelerated by an increase in temperature up to the temperature at which the catalyst is heat altered. After destruction of the enzyme by heat (about 170 deg. F.) oxidation in the cooled solution is much slower than before heating. Liquids containing ascorbic acid oxidase should be heated quickly to destroy the enzyme or the oxygen should be kept out or removed.

The key to success in preserving either natural vitamin C or vitamin C added to a liquid is the elimination of dissolved oxygen and certain oxidizing agents, principally peroxides, which may be produced by reaction with dissolved oxygen. Oxidation catalyzed by ascorbic acid oxidase requires one atom of oxygen per molecule of vitamin C. Catalysts such as copper and light-riboflavin require between one and two atoms of oxygen per molecule. The methods of obtaining the liquid such as milking, expelling or ex-

*Courtesy Hoffmann-La Roche, Inc.*

**How crystals of vitamin $B_1$ look under the microscope.**



*Courtesy Fleischmann Laboratories*

**Iron phosphate under the microscope. Adequate iron is essential to good health.**

*Courtesy Merck & Co., Inc.*

**Nicotinic acid crystals, greatly magnified. Nicotinic acid is a vitamin of the B group which is needed for maintenance of good health.**

*Courtesy Fleischmann Laboratories*

**Enriched yeast cells, which are rich in vitamin $B_1$. Enriched yeast also contains extra nicotinic acid and iron, thereby adding three health ingredients to bread in which it is used.**

**Photomicrograph of riboflavin (vitamin $B_2$) crystals.**

pressing, and of handling the liquid, such as pumping, cooling, running from one vat into another, etc., may result in the solution of 10 or more mgms. of oxygen per liter. This amount of oxygen, if catalyzed by the enzyme, will oxydize 110 mgms. of vitamin C, and if catalyzed by copper or light and riboflavin, will oxidize between 55 and 110 mgms. Thus, if a liquid containing 10 mgms. of oxygen per liter is sealed, 55 to 110 mgms. per liter of vitamin C will be oxidized eventually unless some of the oxygen is utilized in oxidizing other constituents of the liquid.

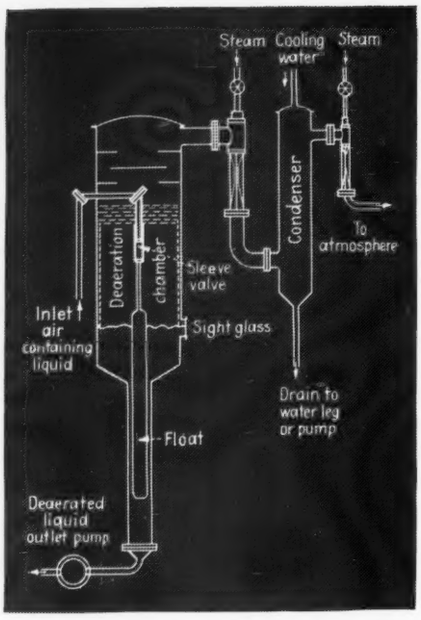
The destruction of vitamin C occurs in two stages. The first stage is a reversible oxidation to dehydroascorbic acid. In the second stage dehydroascorbic acid soon undergoes a chemical change which is irreversible. Dehydroascorbic acid is nutritionally active but does not react with the titrating dye. Since the dehydroascorbic acid soon is converted to the nutritionally inactive form, the dye titrations in general represent the amount of vitamin C activity.

A number of deaerating devices involving vacuum have been developed. Many of them contain baffles, agitators, whirling sprays and other mechanical devices which are supposed to increase the efficiency of deaeration.

The dissolved oxygen can be swept out by a nonoxidizing gas, the cheapest of which is water vapor gas.

The figure illustrates diagrammatically an extremely simple and efficient continuous deaerator for liquids based on this principle. It consists simply of a deaerating shell with an inlet pipe perforated with small holes and closed at the end, which sprays the liquid sucked in against the sides of the shell. A sleeve valve actuated by a float opens or closes the holes and thus balances the rate of inflow with the rate of outflow. This control mechanism is actuated by gravity and involves no holes in the deaerator shell with their accompanying bushings and leaks.

A vacuum sufficiently high to convert some of the water into water vapor is applied to produce the gas for sweeping out the dissolved oxygen. The water vapor and gases pass through a series of baffles to reduce entrainment. The water vapor is condensed outside of the chamber so the noncondensable gases cannot maintain a partial pressure within the deaerating chamber. Two steam jets in series as illustrated make a satisfactory vacuum unit. The vacuum should be sufficient to evaporate rapidly by boiling 0.5 to 1.5 percent of water, causing a drop in temperature of 3 to 10 deg. C. This will reduce the oxygen content to below 0.1 mgm. per liter.




**Continuous-flow deaerator for liquid food products, which removes dissolved oxygen by sweeping it out with water vapor.**

From the standpoint of removal of oxygen, it makes little difference at what position on the temperature scale the actual drop is created. As the temperature increases, the solubility of the oxygen decreases and the volume of water vapor produced per unit of water evaporated also decreases. At low temperatures, the oxygen is more soluble but the volumes of the gases are much larger and consequently are more readily swept out. Apparently these two variables compensate each other approximately. The use of a high temperature range is more economical because the vacuum used need not be so high or of such a large capacity, and less and warmer condensing water can be used. Properties of the liquid itself may be the determining factor in the temperature range most suitable for deaeration.

It is not enough to remove the dissolved oxygen. It must be kept out and the containers filled and sealed without reaerating the product. It is usually inconvenient to place the deaerator at such a height above the bottom of the outlet that the deaerated liquid will flow out against atmospheric pressure; therefore, a pump must be used to remove the deaerated product. The pump must operate against the vacuum, the bearings must be vacuum tight and the pump should be of the constant-displacement type for uniform balanced operation of the deaerator. No pump has been found which will meet these requirements and which, in addition, is sanitary enough in construction to meet rigid requirements of an up-to-date market milk plant.

A bottom-up type, or preferably a true vacuum type, of filler is needed. None is available which will meet the sanitary requirements and other demands of a market milk plant. Fillers have been designed for citrus juices and some other canned products which are to be heat-sterilized after sealing in the cans. Filling with the hot deaerated product and sealing at once while hot can be used to prevent appreciable reaeration in the case of some products. In other cases the containers, previous to introducing the product, can be filled with an inert gas such as carbon dioxide.

# How To Add B Vitamins and Control Content in Flour

## B vitamins are added most conveniently in form of concentrate or "master mix"

By C. H. BAILEY, *University of Minnesota, St. Paul, Minn.*

THE B vitamins involved at present in the flour enrichment program are thiamin hydrochloride or $B_1$, and nicotinic acid. They are available in dry, finely powdered form and relatively easy to mix with other dry, fine powders.

For those reasons their addition to flour has proven most convenient when added in the form of a concentrate. Flour can be used as a filler in such a concentrate; calcium sulphate has also been proposed for use.

The exact composition of a concentrate or "master mix" and the quantity of it fed into the flour stream on a per-barrel-of-flour basis depends in no small measure upon the mechanical facilities which the miller has or can install to make the additions. Also, the composition and quantity factors depend, to some degree,

upon the magnitude of the mill stream.

Standards for enriched flour proposed by the National Research Council Committee on Food and Nutrition specify a minimum of 1.66 mg. of thiamin (thiamin hydrochloride) and 6.15 mg. of nicotinic acid, as well as 6.15 mg. of elemental iron per pound of flour. Since flour contains appreciable quantities of thiamin and nicotinic acid, the quantities to be added should logically be governened by the quantities present.

Flour millers have been advised to consider the quantity of thiamin in a hard wheat patent flour as the "factor of safety" and to add the minimum of 1.66 mg. per pound of flour. With soft wheat patent flours the addition of an extra 10 percent thiamin may be desirable to give a factor of safety.

Analyses or assays before and after the addition of thiamin can be made by any one of several fairly accurate methods to determine: (*a*) The quantity required in addition to meet standard minimums, and (*b*) the quantity present in the final mixture.

CLYDE H. BAILEY

Recent analyses indicate that patent flours contain sufficient quantities of nicotinic acid to meet approximately one-third the recommended minimum. Consequently, the actual addition of 4.0 mg. of nicotinic acid per pound of patent flour should give a minimum total of 6.15 mg. per pound and even exceed that minimum by a substantial factor of safety.

If riboflavin is to be used later in the form of a concentrate, some new problems in making the addition may arise. At present its use is not so common as are thiamin and nicotinic acid. Consequently, no standard practices concerning its use are fully apparent.

# How B. A. Eckhart Milling Co. Makes Enriched Flour

**Method of adding enriching ingredients to flour requires careful control, but can be adequately done with existing facilities**

By W. G. EPSTEIN, Chief Chemist, *B. A. Eckhart Milling Co., Chicago, Ill.*

WHEN the program for vitamin and mineral enriched flour was launched late in January of this year, the demand for mill enriched flour was zero. Only in isolated cases had any attempt been made to market such a flour, either to the baking or the family trades.

Consequently, adding of these enrichments has been a new experience to milling industry technical men, as well as to the practical miller. There was much confusion at first. But the problem of addition was really not as complex as was at first thought.

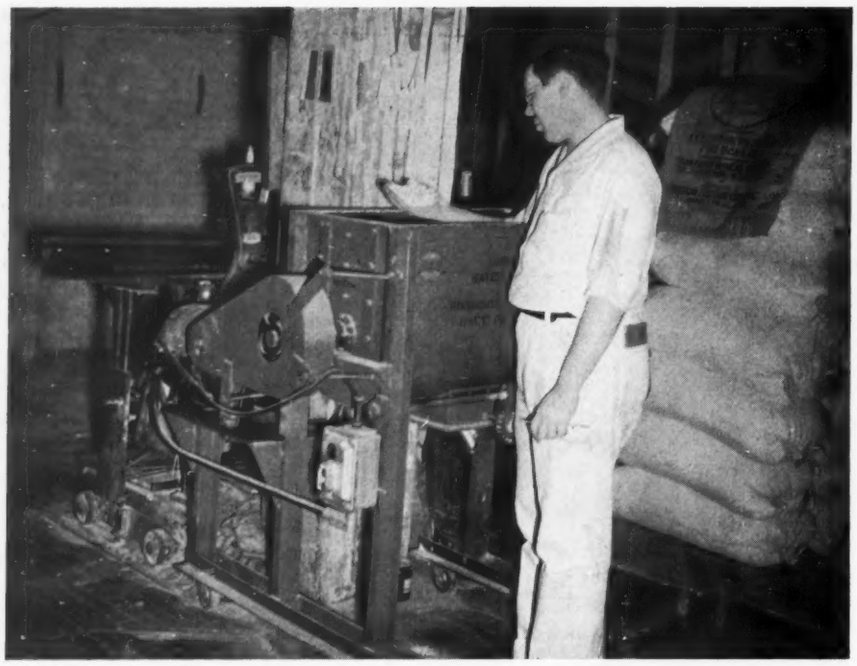
When the problem was considered in its simplest elements, enrichment came to be recognized as the adding of small quantities of vitamin and mineral constituents to the flour in such a way that each unit of the finished flour contained a uniform, definite quantity per pound. The chief difficulty to be overcome was that of blending one part by weight of thiamin into 270,000 parts of flour, and one part by weight each of nicotinic acid and elemental iron into 73,000 parts of flour in such a manner that each part by weight of the enriched flour would be identical in composition with every other part. Even that difficulty is almost wholly one of mechanics.

The miller, as well as the milling technologist, has for years been familiar with the mechanics of adding high strength materials to flours, including bleaching and aging agents, leavenings, and diastatic enzymes. The adding of vitamins and minerals is of practically the same technical significance as the adding of these familiar materials.

From a legal standpoint, the enrichment materials must be present in definite minimum quantities to comply with the Food & Drug Administration labeling requirements and tentative standards for enriched flour. In the addition of the bleaching and aging agents, of the leavens, and of the diastatic enzymes, only the requirements of the trade or the wishes of the company's sales department had to be taken into account. From the cost standpoint, the economics of

W. G. EPSTEIN

the milling industry put a ceiling on the maximum quantity that can be added, if the miller wants to meet the price



First attempt at making enriched flour was by using laboratory "master mixes" made in a small batch mixer commonly used in making prepared flours.

levels of his competitors and continue to stay in business.

The B. A. Eckhart Milling Co., like all other small and medium size flour milling concerns, had to take all these factors into account when it began to make the officially recognized enriched flour.

Several methods of adding the enrichment materials were considered. First of these was the weighing out of the required vitamins and iron in the laboratory, and the making of small batches of a "master mix" in the laboratory for subsequent blending into the various types of flours made by our company. The type of flour best suited would have to be one that was fairly free flowing and granular. In working out these mixes, the natural vitamin and mineral content of the flour was disregarded. Additions were to be made on the basis of minimum requirements recommended by the Committee on Food and Nutrition of the National Research Council as basis for promulgation of standards and definitions by the Food & Drug Administration. The natural content in the flour is regarded as an acceptable factor of safety.

When we experienced difficulty in making up the "master mixes," using flour as a diluent, we considered using malt flour. That idea was quickly discarded because our various flours require different quantities of malt flour to give the desired diastatic enzymic activity. Use of malt flour would have required the making of several different "master mixes."

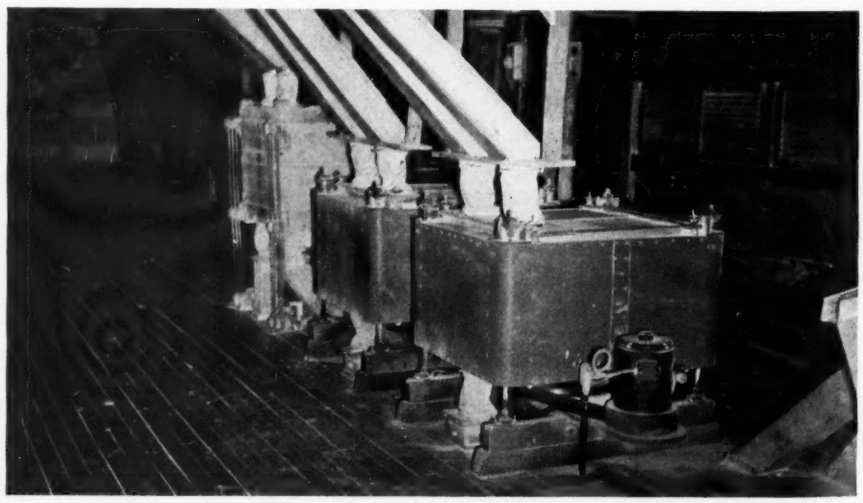
Regardless of whether malted or nonmalted flour be used there is the difficulty of getting the enrichment materials uniformly mixed with the flour diluent. Also, because of the high iron content of the "master mix," these mixes had to be made up fresh every other day if we wished to be on the safe side with respect to the incipient oxidation of the fat in the flour and likely development of rancidity. Blending of the enrichments with flour as a diluent gave rise to an uncertainty about the uniformity of the blend because the enrichments tend to become charged with static electricity and form small pellets or balls in spite of their fine state of division and careful mixing. This static charging developed even when the ratio of enrichments to flour was 1 to 9 on a weight basis and apparently could be overcome only when a combination sifting and mixing procedure was followed. Also, the type or grade of flour used as a diluent seemed to have an effect upon the stability of the "master mix." Best results have been obtained when an unbleached, high grade or short extraction flour made from sound, well-aged wheat was used. The development of rancidity or oxidation of the flour fat appeared to occur at an increased rate when bleached, clear or long extraction flours with relatively high moisture content were used.

In an effort to get away from some of the objections to using flour as a diluent, inorganic salts, such as monocalcium phosphate, calcium sulphate, magnesium sulphate and potassium sulphate were tried. The sulphates worked out quite satisfactorily, especially when the enrichment materials and the salt fillers were mixed together in a ball mill of the familiar design and construction.

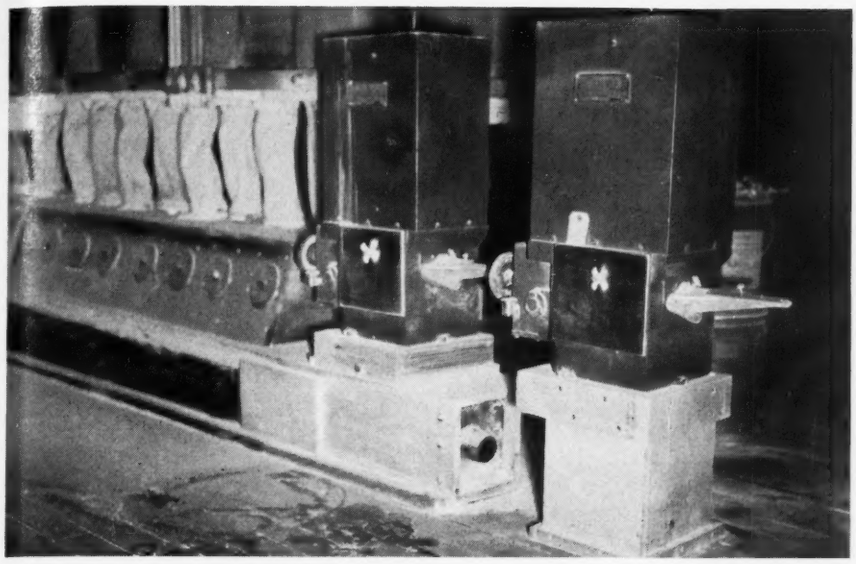
Even though the right combination of enrichment materials and filler or diluent, had been worked out, we still had to take the time and trouble of getting the necessary vitamins and iron and of making the "master mixes" on a laboratory scale.

Finally, we became convinced that we would be better able to standardize our enrichment operations and the enrichment content of our flours if we bought prepared concentrates than if we made our own. The concentrate decided upon can be added directly to the flour stream on the basis of 1 oz. of concentrate to 1 bbl. (196 lb.) of flour through a precision type feeder which has for years been used for the addition of bleaching and aging materials, of leavens and malted flours to flour streams.

The feeder for the enrichment materials has to be separate and supple-



Final and homogenous blending is obtained by sieving treated flour through high speed 9XX mesh silk rebolters.



**Purchased "master mixes" added to the flour stream on the basis of 1 oz. of concentrate to 196 lb. of flour is the procedure followed at present with satisfactory results.**

mental to the feeder used for adding materials other than enrichments to the flour.

The construction of the feeder is such that the enrichment materials are discharged from a flexible metal hopper by stainless steel feed rolls at a precisely controlled rate. Arching and caking or lumping of the concentrate in the hopper are prevented by an eccentric and flexing motion of the hopper which gives an oscillating motion. A visible float riding in the hopper at the top of the feeder unit permits the operator to tell at a glance when the hopper needs recharging. When full, the hopper holds approximately 25 lb. of concentrate. The slow moving feed rolls deliver a ribbon of concentrate across a feed apron to a revolving high speed cutter. This cutter, or impeller, strikes the ribbon of concentrate with such force that its constituents are delivered in a fine spray state into the flour conveyor below and become thoroughly and uniformly distributed throughout the flour stream. Changes in feed are obtained by adjustments of a simple graduate feed slide which controls the discharge rate of the rolls. The feeder has a high and a low capacity feed range. At high speed the feed capacity is from 5 to 52 oz. per hr. At low speed its feed capacity is from 1 to 7 oz. per hour.

Since the feed regulation of wheat into the mills is such that the operator has positive control over the flour output of the mill, the enrichment feeder can be set to assure delivery of the enrichments into the flour stream at the rate of 1 oz. per 196 lb. of flour.

After the enrichment is fed into the flour stream, the mixture is carried by spiral conveyors to a high speed, 9XX mesh silk rebolter in which the finishing blend is made.

Samples are taken at the packers every four hours for laboratory examination. Vitamin $B_1$ determinations made by the thiochrome method are taken as the indication of enrichment level and uniformity of blend.

As the production of enriched flour progresses and we gain some experience data we may be able to take the vitamin $B_1$, nicotinic acid and iron content of the flour into account, reduce our additions proportionally, and still maintain a satisfactory "factor of safety" over minimum requirements. If, and when, we do acquire sufficient data to make such an adjustment, the only change we will have to make will be the rate of feed of the enrichment materials into the flour stream. Our specifications for the "master mix" or concentrate we buy will cover the other adjustments necessary and may even make unnecessary a change in the rate of feed into the flour.

# Addition and Control of Vitamin $B_1$ in Cereals

## Several methods are available, and choice depends upon material treated and the results desired

By F. N. PETERS, *Director of Research, Quaker Oats Co., Chicago, Ill.*

F. N. PETERS

IN the practical introduction of vitamins to a cereal plant force, the first move is to convince the Operating Department that, in reality, the addition of vitamins to a food product offers the same basic problems that attend the introduction of any other new raw material.

The story is told of the shift foreman who had been adding vitamin $B_1$ to a flour mix and after a few weeks he was given new equipment in which the batch was 50 percent larger than he had been making. He came to the chemist the first morning and said: "I have all the ingredients for the larger batch figured out except the vitamin. How much of that shall I add?" Upon being told that he was to add half again as much as he had been using, he replied: "Oh, is that the way those things work? I

thought they were complicated." Too many operating men have the feeling that all normal rules of plant procedure fail where vitamins are concerned.

### *Vitamin Carriers*

Fortification or enrichment with vitamin $B_1$ is generally accomplished with one of four types of material; (1) Specially prepared high-vitamin $B_1$ yeast; (2) yeast or vegetable extracts or concentrates; (3) wheat germ or flour mill streams relatively rich in wheat germ; (4) thiamin hydrochloride. The choice of material depends upon the cereal to which the addition is to be made, the subsequent manufacturing conditions necessary to make the finished cereal, and the availability of the vitamin-rich product itself.

Yeast, wheat germ, and the concentrates are used in products where the additional flavor imparted by them is desirable or where it is masked by the natural flavor of the cereal being treated. Baker's flour, prepared infant foods, or dehydrated soups are products suitable for the addition of wheat germ, yeast, or concentrates. Obviously, there are limits beyond which it is impracticable to raise the potency of the vitamin where wheat germ or some concentrates are used. For example, a good wheat germ might contain 290 International Units of vitamin $B_1$ per ounce. If the cereal product contained 50 units of $B_1$ per pound, the addition of one ounce of wheat germ to 16 oz. of cereal would give a theoretical value of 20 units per ounce or 320 I.U. per pound of finished product. Thus, the addition of approximately 6 percent of wheat germ would be necessary to reach a value of 320 I.U. per pound without any allowance for losses. The same degree of vitamin $B_1$ enrichment could be obtained by adding less than a milligram of thiamin hydrochloride. (1 mg. thiamin hydrochloride is equivalent to 333 I.U. vitamin $B_1$.) The bland taste of farina and rice cereals is likely to be adversely affected by high additions of wheat germ or concentrates. Amounts of thiamin hydrochloride within all practical ranges may be added to the most bland of cereals without changing the taste or appearance.

### *Kind of Cereal Is Important*

In the addition of vitamin $B_1$ to cereals, the texture of the cereal is of importance. If it is possible to incorporate the vitamin carrier in a dough stage, effective and uniform distribution can be made of any of the four types. If no dough stage is available, then the product may be mixed, provided it is in a moderately fine state of division. Comparatively high concentrations of vitamin $B_1$ cannot be introduced into flour by means of wheat germ because of the adverse effect on the baking quality. Pancake mixes can take a fair amount of wheat germ without appreciably changing the appearance, but again the effect on the baking quality must be watched.

At this point mention should be made that on a national scale it would be impossible to use wheat germ exclusively to enrich all flour to a level of 350 units per pound. There is not that much germ available.

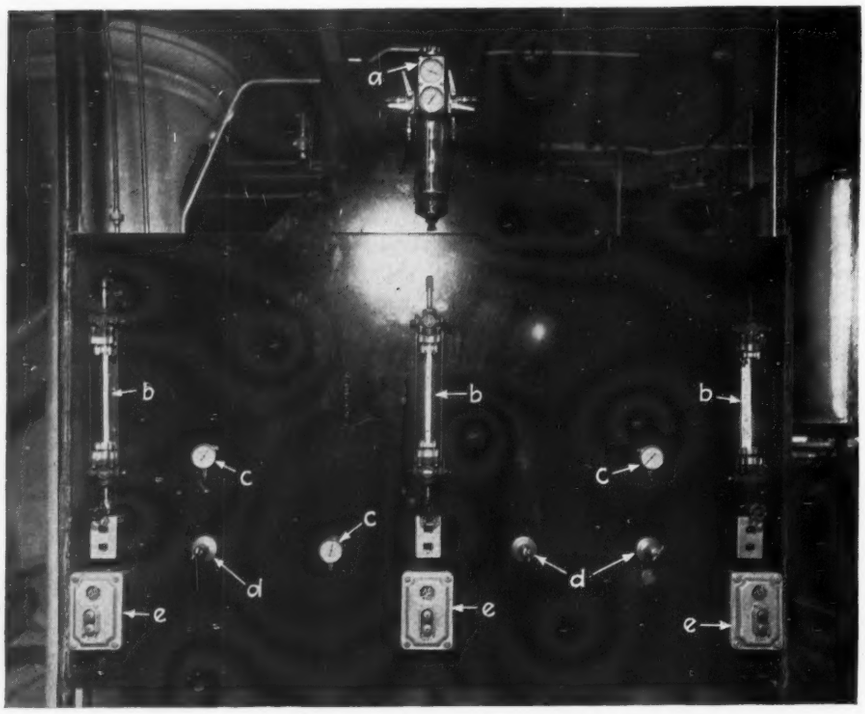
### *Vitamin May Be Mixed or Sprayed*

If the cereal to be treated is in large pieces, such as corn grits or exploded wheat or rice, enrichment cannot be accomplished by a mere mechanical mixture with any of the vitamin products in a dry state. The cereal may be moistened and then mixed with the vitamin carrier. This is not effective with wheat germ and only moderately so with yeast. That method is frequently successful with yeast extract or vegetable concentrate, but is not practical with thiamin unless the latter is made into a premix with flour, meal, or some other diluent. Instead of merely moistening the cereal, an adhesive binder may be used. Simple sugar sirup, honey, malt sirup, aqueous salt solution, dextrines, pastes, and even oils or fats may be used. These have the advantage of imparting flavor as well as serving more effectively to bind the vitamin carrier to the surface of the cereal.

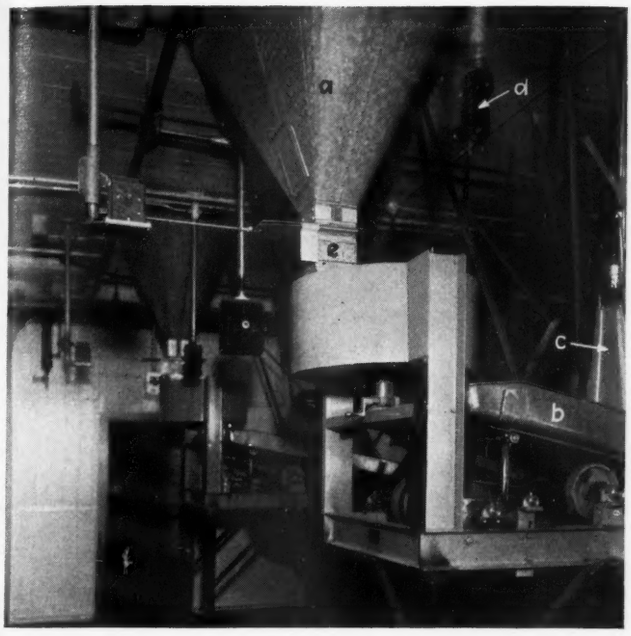
Batch treatment will give fairly uniform results, but continuous application is much more difficult. Successful continuous application of yeast to wheat products has been accomplished by passing a stream of wet wheat at a uniform rate through a screw conveyor under a rotary feeder, which adds a uniform amount of yeast-flour premix to the cereal.

Although the premix is not dropped onto all the individual wheat berries, the mixing action in the conveyor is such that uniform distribution occurs very quickly. By this means it is possible to add as little as 0.5 percent of premix to the wheat with an accuracy greater than can be obtained by biological $B_1$ assays.

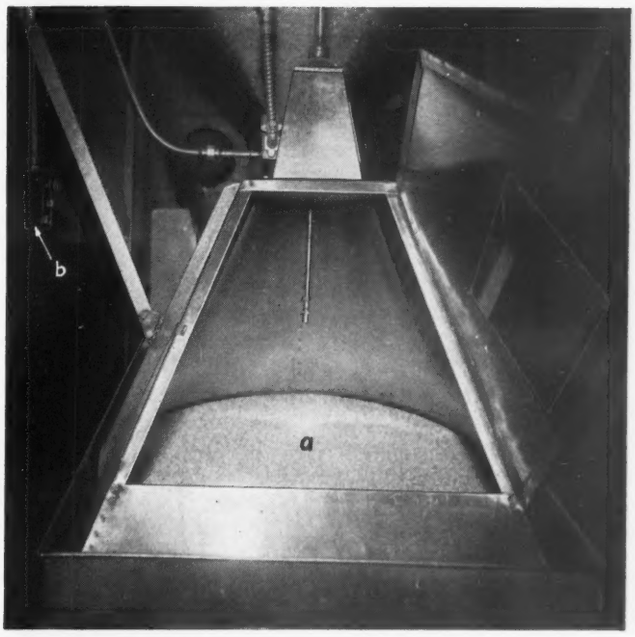
Still another proven method of $B_1$ addition is to spray a solution or emulsion of the vitamin either in a batch mixer or on a vibrating conveyor or mixing conveyor. An emulsion or suspension of yeast, wheat germ, or concentrate may be used. For general convenience a solution of thiamin is preferred. By this method mixtures of several vitamins may be added. It involves




**Operation of vitamin spray equipment is controlled from a panel board having valves and gages (*a*) connected with compressed air main, rotameters (*b*) through which the vitamin solutions pass, pressure gages (*c*) for individual vitamin treating tanks, air regulating valves (*d*) to each spray nozzle and motor switches (*e*).**




In one type of installation vitamins are applied to puffed cereals by spraying in hood (*c*) as they move along on vibrator conveyor (*b*) fed from hopper (*a*). Electric eye (*d*) causes stopping of spray when cereal stops passing (*e*).




View under hood of vitamin spray chamber in which vitamins are applied to cereals on vibrator conveyor (*a*) in a barely visible mist-like spray and under automatic control by an electric eye (*b*).

expert technic to control uniformly the rate of spray and the rate of flow of the cereal product, both of which are necessary if uniform distribution is to be had. There is always the danger of the spray nozzle plugging or of the flow of cereals diminishing or increasing. To make the process successful, as well as continuous, requires a substantial investment in equipment. On the other hand, batch spraying, similar to the application of cheese to popcorn, is simple and quite effective.

Before using either of the last mentioned methods, consideration must be given to the cereal itself. Is it in such condition that water can safely be added? How much water can be added without affecting the keeping quality, texture, or appearance of the cereal? Must the water subsequently be removed? If so, how will it be done? What will be the drying cost? If oil binders or emulsions are used, are they stable or will rancidity develop?

### *Handle With Care*

If a paste, emulsion, or solution of vitamin carriers are used, there are problems connected with the storage and preservation of the carriers. Aqueous solution of thiamin may become inoculated with bacteria, which can destroy the vitamin with almost unbelievable rapidity. Mold may develop on the paste. The emulsion may break and give nonuniform results. The wheat germ may become rancid.

In general, these problems can be overcome by keeping mixing vessels, lines, paddles, and other devices used as sterile as possible. The sanitary precautions used in a creamery can well be applied to the addition of vitamin $B_1$ to cereals. Refrigeration, another ally of the dairy operator, is equally useful where $B_1$ solutions or pastes are handled.

Thiamin in the dry state is reasonably stable, even at temperatures of 150 deg. F. for long periods. In solution it is rapidly destroyed under alkaline conditions. Even though slightly acid, it may be unstable at the temperature of boiling water. Acidities between a pH of 3.0 and 6.0 are recommended where possible to obtain them. Sulphites and similar sulphur compounds must be rigorously excluded. Sulphur dioxide in the air from a bleaching tank or from any source whatever may cause damage. If deep well water is used at any stage of the process, it should be examined for components harmful to thiamin.

### *Care Needed in Manufacture*

Finally, consideration must be given to the stability of the vitamin as it is affected by the manufacturing processes subsequent to the addition of the vitamin. High temperatures for prolonged periods are destructive. Lower temperatures and moist conditions may be harmful. The explosion treatment of cereals appears highly destructive to vitamin $B_1$. On the other hand, it is possible under very exact condition to flash-dry some products with but little loss in vitamin content. Baking conditions, as for ordinary bread, may destroy 10 percent of vitamin $B_1$. More drastic heating may destroy considerably more. This heat treatment may do more than destroy the vitamin where wheat germ or similar vitamin carriers are used. The flavor of the product may be adversely affected by caramelization of sugar in the germ and there may be increased tendency toward the development of rancidity, through splitting of the oil and destruction of the protective enzymes in the oil.

After the cereal has been enriched, samples of the finished product should be tested for vitamin potency. This sampling and testing should be at regular and fairly frequent intervals. Theory is no substitute for experience. All too often a vitamin, which theoretically should be present, is lacking when submitted to test. Therefore, test and retest and continue to test as a matter of protection against marketing a product whose vitamin content has diminished during storage or because of unforeseen reasons.

No attempt has been made to cover all the methods now in commercial use, nor to describe any in complete detail. All that is really needed for the practical application of vitamin $B_1$ to cereals is a clear conception of what is to be treated and of what is the desired result, with the avoidance of unsanitary conditions, too much heat, too little acid, and not enough horse sense.

# Vitamin Control For Baking Industry

## Selecting raw materials, evaluating methods of introducing vitamins, assaying the product, sampling

By R. T. BOHN, *Director, Products Control and Development Department, General Baking Co., New York, N. Y.*

WIDESPREAD interest in the addition of vitamins to bakery products has increased the responsibilities of chemists connected with baking companies, or with organizations servicing the baking industry. It is the responsibility of the laboratory to:

*a. Select proper raw materials*

Selection of proper raw materials is becoming one of increasing importance. A survey must be made of the vitamin content of all raw materials being used in the company's products and then, where possible, new sources or types of these materials must be found which have high natural vitamin content and yet do not affect the product adversely. The cooperation of the executive and advertising departments will be required if a change in the character of finished product appears advisable. Raw materials containing larger amounts of naturally occurring vitamin will, obviously, require less fortification, resulting in a proportional reduction in costs.

*b. Evaluate methods of incorporating vitamins*

Once the proper raw materials have been selected, it then becomes the duty of the laboratory to select the method of incorporation. In the baking industry, as in most others, there are several methods available for increasing the vitamin content, and these must be evaluated carefully as to strength, cost and adaptability to present production procedures. The strength should be such that the necessary quantity for a batch can be accurately and easily measured. Costs vary with methods of manufacture and should not be considered alone. Ease of incorporation and effect on finished product may also affect it.

A method of incorporation which will require no change in plant procedure is ideal. This is the case when raw materials are used which have already been enriched by their manufacturer. The use of such materials eliminates the chance of improper weighing of the vitamins and the chance that they might be left out of some batches. This advantage is particularly true of raw materials which would cause a noticeable change in the product when not included.

RAY T. BOHN

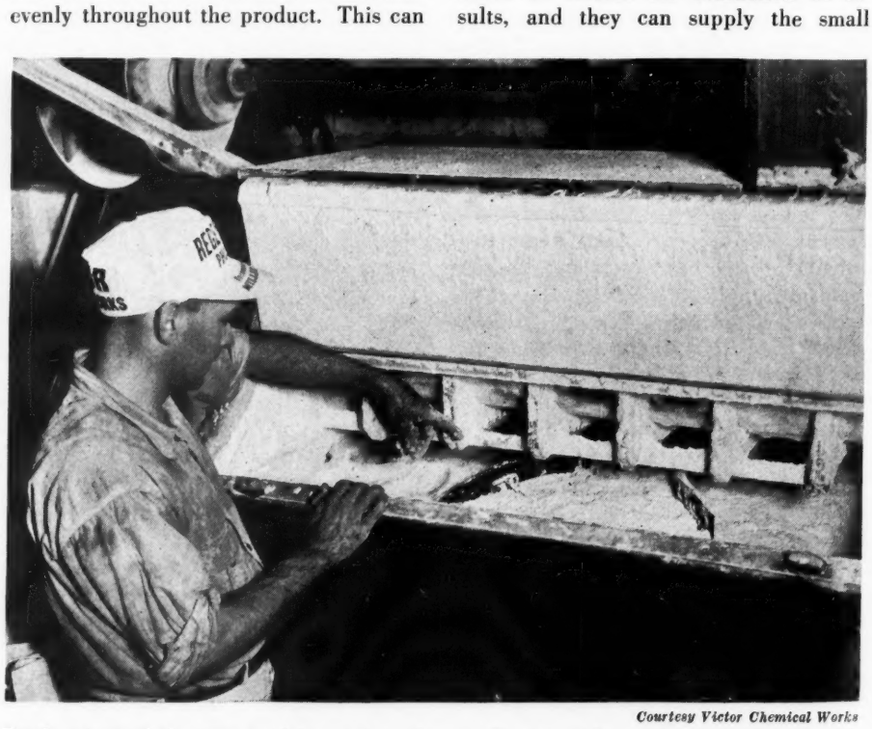
The laboratory must also be sure that the method used distributes the vitamins evenly throughout the product. This can be determined, in some cases, from experience with other materials, but it should be checked by assay.

*c. Assay the baked product*

Once the raw materials and method of enrichment have been decided upon, the vitamin content of the finished product must be guaranteed by the laboratory to meet all government laws and rulings and to comply with all statements made by the advertising department. No copy should be released for publication without the laboratory's approval.

Since vitamin assays in the past have been confined to research groups almost exclusively, the average control laboratory has neither the personnel nor equipment necessary for fulfilling the foregoing assignment. Research workers are only now beginning to come to some agreement on the proper methods of analysis to use, so that the average control chemist must spend some time becoming familiar with the methods before he can depend on the accuracy of his results.

The equipment used in these analyses is, in some cases, expensive and heretofore has been of little use to a control laboratory, so that new equipment will probably have to be purchased. By keeping in touch with the reports of committees working on methods of analysis and proper equipment for them, the laboratory can select the proper procedure and familiarize its personnel with it in a reasonable length of time. Consulting laboratories which have taken on this type of work serve as an excellent check or referee for evaluation of results, and they can supply the small



*Courtesy Victor Chemical Works*

**Batch mixer of the type widely used in flour mills for adding vitamins and minerals to enrich flour.**

manufacturer who has no laboratory of his own with satisfactory assays.

### *Problem of Proper Sampling*

The question then arises as to proper sampling for analysis. How many samples are necessary to guarantee the vitamin content of a product and how often should they be taken? This question depends on uniformity of raw materials, processing variations and distribution of vitamins in the original batch. A large number of samples run on several batches and samples run on each day's production will soon show up what variations can be expected in any one product. Future sampling procedure can then be based on these findings. General practice is to use a sufficient quantity of enrichment materials to allow for reasonable variations.

The baking industry is fortunate in having several raw materials containing vitamins and minerals available, which are so necessary to the product that it is ruined if they are omitted. For instance, bread will not rise without yeast, and bread is not bread if it does not contain flour. If a reliable manufacturer supplies these materials, the baker can be reasonably sure of putting out a product containing the vitamins claimed and only an occasional check-up by laboratory analysis is necessary.

# How To Sample Bread For Vitamin Assay

**Even though dosage and baking procedure are standardized, assays for vitamin content of finished product are desirable**

By L. W. HAAS, *Director, W. E. Long Co., Chicago, Ill.*

SAMPLING of bread and similar foods which consist of large coherent masses is a difficult procedure because the units, such as loaves, from various batches cannot be mixed as can powders or liquids.

When the ingredients or constituents to be tested for are enrichment substances, particularly vitamins, there is the added difficulty that a single unit is not likely to have a uniform vitamin content throughout its mass. Certainly, in a loaf of bread, the crust contains less vitamin $B_1$ than does the crumb. Also, there are variations in different parts of the crumb.

These variations are explained in part by the effect of the baking heat to which the various portions of the loaf are exposed. Other unusual difficulties which have to be contended with in controlling the vitamin content of bread arise from the nature of the product itself and from the operations involved in its making.

Bread is made by the batch method involving separate dosage of each ingredient used for each batch mix. There are unavoidable variations in the weights of the ingredients for each batch.

In the case of vitamins, they may be added separately in the form of special concentrates or "master mixes," or they may be introduced as constituents of regular ingredients such as flour or yeast.

L. W. HAAS

Even if utmost care is taken to introduce the vitamins accurately, further handling and processing of the dough may cause measurable variations in the vitamin content of the finished bread.

What goes on in the bake oven itself has a particular bearing on these variations. Different types of ovens, even the location of the loaves in the same oven, may give rise to differences in the vitamin content of baked bread made from the same dough batch. Another complicating factor in the loss of vitamins in the oven is the influence of the weight, style and dimensions of the loaf. These factors have an influence because of the variations in baking time and temperature they require and because of the different ratios between crust and crumb in the various loaves.

The greatest destruction of vitamins logically occurs in the crust and in the loaf which is exposed to the oven temperature for the longest period of time. An identical loaf baked less thoroughly has a lower vitamin loss.

Because the vitamin content of baked bread does depend upon a number of factors other than accurate dosage of enrichment materials, all of those factors must be controlled as carefully as possible if satisfactory uniformity in vitamin content is to be expected. Also, if reasonably accurate "factors of safety" are to be maintained, determination of vitamin loss during baking under certain conditions becomes necessary for each style, shape and size of loaf. Only when that has been done can the dosage of enrichments and the baking conditions be standardized to give loaves of the various breads containing the expected vitamin content to meet at least the minimum requirements.

Even though standardization of dosage and of baking procedure are obtained and religiously followed under bakeshop production conditions, assays for vitamin content of finished loaves are desirable. Unfortunately, such assays or tests are rather expensive, and a large majority of baking concerns are not equipped to make them. Nevertheless, bakeries producing "enriched" bread or other breads rich in vitamins should systematically build up a record of vitamin assays for reference purposes as a defense against challenge. Dependence entirely on the guaranteed potency of vitamin materials used is not sufficient protection in case of seizure of products by F&DA enforcement authorities. Further, a liberal margin above the minimum requirements should be sought as a "factor for safety."

Records of assays on representative samples of each day's production are highly desirable. But such practice would be too burdensome to follow in most instances.

Instead, assays or tests should be made at regular intervals—at least once a month, or preferably every two weeks, if every week is not practical.

Because of the factors involved in assaying a loaf of bread for vitamin content, sampling should be done on a whole-loaf basis; certainly not less than a half of loaf cut vertically into two equal parts should be used. The loaf, at least the half-loaf, is air dried at temperatures below 50 deg. C. (122 deg. F.), ground to pass through a 60-mesh sieve, and

made into a uniform mixture from which a sample for analysis may be taken.

To obtain a representative sample of a day's production for assay purposes, several half-loaves (sliced if the bread is marketed that way) should be picked at random during the day's run of vitamin bread. After careful weighing, these half-loaves should be dried to less than an 8 percent moisture content in approximately 24 hours at a temperature not exceeding 50 deg. C. (122 deg. F.) to avoid vitamin $B_1$ loss. After the air-dried bread has been weighed to determine drying loss, it is crushed to a coarse powder by means of a clean rolling pin, or some other suitable means, and thoroughly mixed.

The mixture may then be quartered and the crushing, mixing and quartering procedure repeated until the blended sample has been reduced to 8 oz. or any other desired quantity. The last quarter portion should then be finally ground to pass a 60-mesh sieve to be assayed or stored in a tightly closed glass or metal container, in a refrigerator for future use.

Bread samples can be taken and prepared in this way every day for immediate assay or analysis, or they may be kept for many months and assayed when required. These samples may also be used for preparing composite samples. Equal quantities by weight of each sample covering definite intervals of production are mixed and tested as and when desired.

From the assay results on the air-dried samples, taking into account the existing moisture content and the loss in weight during air drying, the vitamin content of the original bread may be easily calculated.

# How to Sample Flour For Vitamin Assay

**Both method of taking sample and method of adding vitamins must be controlled to assure desired results**

By W. L. HEALD, *Assistant Director of Laboratories, W. E. Long Co., Chicago, Ill.*

REGARDLESS of the identity of materials under study, no one factor has a more important bearing upon the final results of control laboratory tests than the taking of samples for test.

Those who have had experience in running protein analyses on wheat at the beginning of wheat crop movements realize fully the significance of that statement. A one-gram sample for the protein test must be representative of a given lot of wheat; perhaps a carload of 1,500 bu. What does a one-gram sample from 1,500 bu. mean? It means that the one part to be analyzed must be representative of 6,804,000 parts by weight in the entire lot.

Analyzing flour for the presence and distribution of enrichment materials presents a somewhat parallel problem. If flour is brought up to the minimum requirement of 1.66 mg. of vitamin $B_1$ per pound, 1.26 mg. of thiamin will have to be added to each pound of flour having a natural content of 0.4 mg. of $B_1$ per pound. Addition of 1.26 mg. per pound of flour is equivalent to one part in 360,000 parts by weight. Expectation of analytical results anywhere near the theoretical involves extreme care in the mixing of the thiamin into the flour as well as in sampling it.

W. L. HEALD

Those conditions bring up the question of how should the enrichment materials be added, as well as how should the samples be taken to make sure that they are representative or are indicative of a uniformly enriched flour. Since visual examination reveals nothing in respect to the presence or distribution of vitamins, a chemical examination is necessary, as is required for other constituents in flour such as moisture, ash, protein, starch, and the like.

### *Preliminary Tests*

One physical or microscopic examination of freshly mixed and unbolted enriched flour can be made to make certain that the vitamin enrichment mixture is in as fine, or finer, state of division than the flour. If it is not, at least some of the enrichment will be screened or bolted out of the flour and will go into the feed.

Another preliminary examination to make is to check on the operation of the ingredient feeder to make certain that it operates at the prescribed rate of feed, assuring accurate addition of enrichment materials. Strength of the enrichment mixture as well as its fineness largely determine the selection and the calibration of the feeder.

Performance of the feeder should be systematically checked at regular intervals, with an auxiliary feeder in operation during the checking period, if the flour mill is operating on a continuous operation schedule.

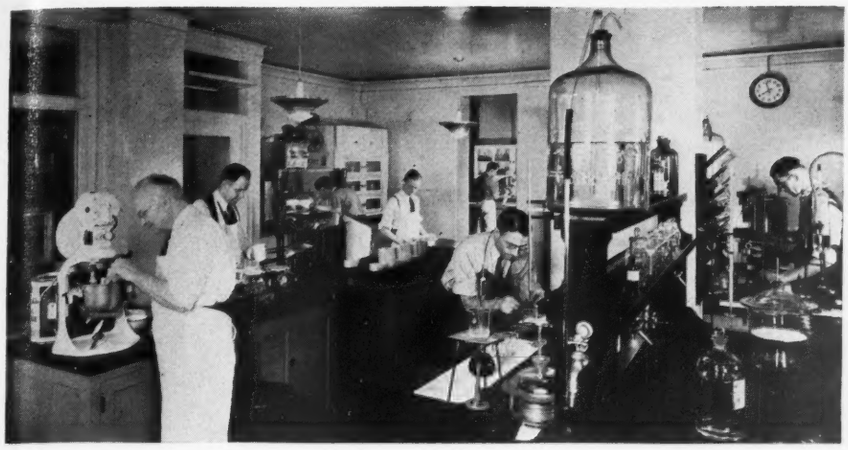
Correct checking of the feeder involves weighing of its discharge for a definite period of time; for example, 5 minutes. A series of three to five weighings should be made to determine that the checking tests give reproducible results. In addition to these checkings, insurance of uniform performance of the feeder, to give uniform dosage of enrichments to the flour, also requires vigilance on the part of the miller.

### *How to Sample*

With the assurance that the enrichment materials have been added in the proper state of fineness and in the proper proportions, as far as the feeder is concerned, the next step in flour examination is to be certain that the flour contains the required minimum quantities of the enrichments and that they are uniformly distributed through the flour. Then comes the question of how many samples to take, and of where they should be taken.

The number of samples to take depends somewhat on the packing equipment. If packing is done by blending from several flour-storage bins, fewer samples will be needed than if packing is done directly from the mill stream. Under usual or typical conditions the following sampling procedure should insure adequate accuracy for shipments of enriched flour:

1. Take a 9-oz. sample from the first bag or container going to fill an order. When the order is one-third complete take a second sample, with a third taken



**Analyzing flour for presence and distribution of vitamins presents a laboratory problem quite similar to that of analyzing for other constituents. The analysis result can not be accurate if incorrect sampling has been done.**

when the order is two-thirds complete and the fourth and final taken from the last bag or container of the order.

2. Preserve the identity of the samples by using airtight containers and keeping in refrigerator. Weigh an equal quantity of each into a mixing container large enough to permit thorough blending by tumbling the contents 25 or more times. Take sample for analysis or assay for vitamins from the blended sample.

### *Official Sampling Method*

For sampling a carload lot or a warehouse stock in piles, the recommended procedure is given on page 206, fourth edition (1935), Methods of Analysis of Association of Official Agricultural Chemists. It is:

"Sample a number of sacks equivalent to the square root of the number in the lot, but not less than 10; for example, take sample from 10 bags from a lot of 100 bags or less, 15 from a lot of 225, 20 from 400 bags and so on.

"Select the sacks to be sampled according to their exposure in the ratio of 4 from the most exposed, 3 from the less exposed, 2 from the next, and 1 from the least exposed portion of the lot.

"From each sack to be sampled, draw a core from one corner of the top diagonally to the center of the sack by means of a cylindrical, pointed, polished metal trier, one-half inch in diameter, with a slit at least one-third of the circumference. Draw a second core from the other top corner to one-half the distance to the center of the sack.

"Deliver the two cores at once to a clean, dry, air-tight container which has stood open for a few minutes near the lots of flour to be sampled, and seal immediately. Use a separate container for each sack sampled. One of the following containers may be used: (1) A pint fruit jar provided with a rubber gasket; (2) a rubber pouch which can be tied or sealed to exclude moisture or air. (3) a tin can or box with a moisture- and air-tight friction top.

"Before opening the sample for analysis, alternately invert and roll each container 25 times, or more if necessary, to secure a homogenous mixture. Avoid extreme temperature and humidities when opening the containers for analysis. Keep the sample tightly sealed at all other times."

While the procedures outlined in these two methods may not be the best for sampling all enriched flours or may not meet the needs for all conditions encountered, they are recommended procedures and can be the basis of procedures needed to meet unusual cases.

# Role of Independent Laboratory in Product Control

**Affords impartial, unbiased data to aid manufacturer in avoiding pitfalls of improper control. Has benefit of wide experience and extensive equipment**

By BERNARD L. OSER, *Director, Food Research Laboratories, Inc., Long Island City, N. Y.*

BERNARD L. OSER

AT every stage in the history of a food product the training, experience and judgment of the technologist play a vital role. Food manufacturers who entered the field of fortification or who developed claims for the vitamin content of their products only after benefit of competent technical guidance and control have had reason to feel rewarded for their farsightedness.

Manufactured food products are like human beings in that they are first conceived and slowly developed, then are nurtured and molded to be good "citizens," and finally, when they seek their fortunes in the outside world, are subject to governmental control. Laboratory confirmation of vitamin content is necessary, not only in the case of fortified or enriched foods, but for natural foods which have been formulated, processed or packed and for which claims of vitamin potency are made. The regulations to be promulgated under Sec. 403 (j) of the Federal Food, Drug and Cosmetic Act

will not, in all probability, designate which foods must bear statements of vitamin unitage on their labels, but will provide that those foods for which claims of special dietary usefulness are made shall (with certain exceptions) bear quantitative statements of vitamin content. Despite vigorous efforts made at public hearings to exclude natural foods from the requirements of this provision, there is little likelihood of such exemption.

It is necessary not only to establish the maximum and minimum levels of claimed nutrients present naturally in foods but to regulate processing and packaging conditions so that the original values are retained to the fullest possible degree at the time the consumer makes the purchase. In the case of foods whose natural vitamin content has been augmented by the addition of either vitamin concentrates from natural sources or the pure crystalline vitamins, it is essential to control the uniformity and degree of fortification and the stability during processing and during shelf life. In these connections the services of the independent laboratory are of great value not only because they are available in special fields in which plant control laboratories may not yet have the necessary facilities or experience, but because they provide impartial and unbiased data to corroborate or refute the findings of the plant chemist. The latter may possess sufficient human frailty to show off his "baby" in the best possible light.

An independent laboratory should have no stake in any product. Its very existence depends upon its ability to maintain and preserve a reputation for establishing facts as accurately as possible within the limitations of the methods employed. Rather than attempt to cover the entire field of applied science, the independent laboratory should achieve competence in certain specialties. In the course of years of experience, a knowledge of practices in various fields and a diversity of specialized apparatus and equipment are acquired, which often permit a more immediate and direct attack on a problem than is possible in the usual plant control laboratory. The independent laboratory is frequently called upon to ascertain what may be contained in certain raw materials or what may be the effect of certain processes on the nutritive values of food products before an industry institutes innovations necessitating plant control. No little emphasis should be placed upon the library facilities of the independent laboratory, which usually cover a much broader range of subjects than a plant library (and no modern plant can be without one).

*Courtesy Nopco Vitamin Laboratories*

**Biochemical laboratory for research and control of water-soluble and fat-soluble vitamins.**

The following questions are typical of those that are presented to the independent consultant in connection with the vitamin aspects of foods:

1. What vitamins are naturally present and can we claim them on the label?
2. How shall we word our label to conform to legal requirements? (In this connection the method of expressing vitamin unitage in understandable terms and the consumer reaction to the method of listing ingredients must receive special consideration.)
3. What vitamins should we add and to what levels?
4. What sources of vitamins shall we use and where can we obtain them? (The factors that must be considered in this connection are legal, organoleptic, chemical (stability), engineering (distribution) and economic.
5. How often, and how, shall we have our product tested for vitamin stability?
6. Is the stability of our vitamins affected by pH, air, light, heat, enzymes, age, metallic contamination, etc.? If so, how can we preserve them?
7. What margin of safety should be allowed in making vitamin claims?

From the nature of these questions it is obvious that the experience of the independent specialist in this field is more likely to extend into realms beyond those traveled by the food plant control chemist.

An important phase of the services of an independent laboratory is based on the very fact of its independent status, viz., the conduct of tests or assays which form the basis of commercial transactions involving the evaluation of the vitamin content of natural materials, such as fish oils, yeast concentrates, etc. This type of work demands complete lack of bias, since laboratories specializing in such work are often designated in contracts as referees whose verdict is "final and binding." Another aspect of this service is the independent checking of

*Courtesy Dairy Laboratories*

**Littrow spectrograph used by Dairy Laboratories, New York, for quick and accurate determination of vitamins A and $B_2$.**

potency claims. This may be necessary for control purposes, to justify the advertising asset of careful, impartial confirmation of claims, or, as in the case of vitamin D milk, vitamin A fortified margarine, and so forth, to meet the requirements of health officials, the American Medical Association, licensors of vitaminizing products or processes, etc. Such control assays conducted on open-market samples purchased at least several times a year, but at unstated periods, serve not only to satisfy official requirements but to engender consumer confidence.

Not so many years ago, the chemistry of vitamins was in an embryonic stage and the only available assay methods were biological. These procedures involved many weeks and considerable expense. Today biological methods have been improved and considerably shortened, and laboratories specializing in these assays maintain colonies of animals on depletion diets so that a regular supply of animals is available for immediate use in the more common assays. Biological methods still retain certain advantages of accuracy though they lack the precision (*i.e.*, reproducibility) of chemical and physical methods. Nowadays independent laboratories are equipped to conduct the chemical (*i.e.*, colorimetric or fluorometric) tests (for carotene, thiamin, riboflavin, ascorbic acid, nicotinic acid, etc.), microbiologic assays (for riboflavin, pantothenic acid, nicotinic acid, biotin) based on the growth and metabolism of bateria in special nutrient media, and physical tests (for vitamin A especially) based on the photometric measurement of spectral absorption bands. That extensive facilities and equipment are necessary in the application of such a diversity of procedures is apparent even to the non-technical mind.

It is interesting to note that some of the most active clients of independent laboratories maintain large technical staffs themselves. However, just as the accounting and legal departments of industrial organizations engage the services of outside experts, so the scientific work often benefits from the specialized and independent viewpoint of the consultant.

In fact, some companies have retained consultants as directors ex-officio of the research activities of their own laboratories.

Familiarity of the independent consultant with the internal workings of a plant or a product often stands in good stead when his services are needed in litigation or testimony before government agencies.

A valuable service is rendered to its clients when the responsible directors of an independent laboratory attend scientific meetings and follow the literature closely so as to become familiar with new analytical and assay methods and with technological advances of interest to the fields they serve. Moreover, the laboratory staff should always be engaged in independent or collaborative research on new methods and in otherwise advancing the frontiers of knowledge. The advantage is always to the practical scientist who can anticipate the trends of industry.

The use of competent scientific advice and control is one of the safest measures that a food manufacturer can employ to insure his products against such ailments as falling sales, excessive competition and "government trouble." This is, indeed "preventive chemistry."

# Quick Review of Chemical Methods For Determining Vitamins

## Technics used for vitamins $B_1$ and $B_2$, nicotinic acid and vitamins $B_6$, K, E and D

By ARTHUR W. THOMAS, *Professor of Chemistry, Columbia University, New York, N. Y.*

THE reference to chemical methods for determining vitamins in foods in the title for this bare inventory of methods for determination of the vitamin potencies of natural products, with or without added synthetic vitamins or vitamin concentrates, might better read: "Methods not involving the use of animals," because certain microbiological methods are also included. In a short statement on this extensive and rapidly growing subject, variations of the methods cannot be included, and a few of the suggested methods are omitted.

### *Vitamin A*

A well-developed, although intricate, method for this vitamin in fats is the spectrographic measurement of the absorption of light of 3280 Angstrom units wavelength. It is best applied to a suitable solution of the unsaponifiable matter of a fat. Recently it has been proposed to substitute a photoelectric device for the spectrograph, thus greatly lowering the cost of the required apparatus. This method is promising.

ARTHUR W. THOMAS

The formation of a blue color when a chloroform solution of the vitamin is treated with antimony trichloride, long used for approximate estimations, has been developed for more exact measurements by using a photoelectric colorimeter. The color fades rapidly, requiring rapid manipulation.

Carotene, or provitamin A, is readily measured colorimetrically, preferably in a photoelectric colorimeter.

### *Vitamin $B_1$ or Thiamin*

Thiamin, or more exactly thiamin chloride-hydrochloride, may be determined quite satisfactorily by any of three methods.

It may be oxidized to thiochrome, the fluorescence of which is measured in a fluorophotometer, or it may be converted to a red-colored compound by reaction with diazotized para-aminocetophenone. The intensity of the red color is measured in a colorimeter. Vitamin $B_1$, greatly accelerates the fermentative activity of yeast, and a method based on this behavior consists in the measurement of the volume of carbon dioxide produced by the yeast, under carefully controlled conditions.

### *Vitamin $B_2$ (G) or Riboflavin*

Here also three methods are widely used. The riboflavin content of a solution may be determined colorimetrically (riboflavin solutions are yellow) or by the intensity of its fluorescence in light of 4400 Angstrom units wavelength, or it may be measured by a microbiological procedure. In the latter method, the effect of riboflavin on the growth of *Lactobacillus casei* $\epsilon$, which is within limits proportional to the amount of this vitamin present in a suitable culture medium, is generally gaged by the amount of lactic acid produced by the bacilli. Recently this same bacillus has been suggested for the measurement of pantothenic acid. A minor modification of the culture medium is required as well as the presence of sufficient riboflavin.

### *Nicotinic Acid (or Amide)*

Nicotinic acid in aqueous solution reacts with cyanogen bromide and an aromatic amine forming a yellow substance. The amount of nicotinic acid originally present is measured by the intensity of the yellow color. This color is not permanent, developing to a maximum intensity followed by gradual fading. The amide is converted to the acid prior to the reaction with the reagents named.

### *Vitamin $B_6$ or Pyridoxine*

Two colorimetric methods have recently been proposed, neither of which is entirely specific. It is too soon to discuss them.

### *Vitamin C or Ascorbic Acid*

For several years the titration of an acid aqueous extract with the dye, dichlorophenol indophenol, has in most cases yielded satisfactory results. The reaction between reduced ascorbic acid and this dye has also been made the basis of a photoelectric colorimetric measurement particularly designed for highly colored solutions. A simple method that sometimes serves well enough for routine checking consists in the titration of the acid extract of reduced ascorbic acid by an iodine solution. Its applicability to a particular extract, however, must be verified by comparison with the "dye" titration.

*Courtesy General Foods Corp.*

**Dr. Robert Conner and his assistant, Gilbert Straub, General Foods Corp., operating the complicated apparatus used for chemical determination of thiamin and riboflavin in cereals. These men developed methods for determining in a single sample these elements of the vitamin B complex.**

### *Vitamin K*

There are several substituted naphthoquinones which possess vitamin K activity, and hence any one chemical method of assay is not to be expected.

### *Vitamin E or the Tocopherols*

The tocopherols (there are three of them) in alcohol solution reduce ferric ion to ferrous ion. The latter forms a reddish colored complex with $\alpha$:$\alpha$-dipyridyl which is measured in a colorimeter. The tocopheroles in alcohol solution also develop a deep red color when boiled with concentrated nitric acid. Both these methods have been proposed, as well as the potentiometric titration of an alcohol solution with auric chloride. The results of chemical assay may not always agree with those of biological assay because the three tocopherols do not possess the same biological activity.

### *Vitamin D*

Recently a spectrophotometric method has been proposed for the determination of vitamin D in fish liver oils based on its reaction with antimony trichloride to form a pink color. The vitamin A present is destroyed by treatment with maleic anhydride.

### *Extraction of Vitamins From Plant and Animal Tissues*

Measurements discussed up to this point refer only to the measurements applicable to extracts of the vitamins free from substances which would interfere with these measurements. In a brief inventory of methods, it is not possible to discuss the extraction procedures in detail. It is to be noted, however, that frequently they are tedious and difficult either in chemical nature, or in physical manipulation, or both. Frequently an extraction and purification procedure for a certain vitamin in a given natural product will not work for another natural product. Hence, the chemist is often confronted by an investigational program when he attempts to apply a method workable for one food to a different kind of food.

It is not an exaggeration to say that no extraction process is perfect. The imperfections are either failure to eliminate interfering substances, or to extract the vitamin completely or without any destruction. Then, after the extraction, the procedures as previously outlined are in many cases not free from errors.

Reference standards on pure vitamin solutions must be run either with each unknown or at least every day.

Another point to be borne in mind is that we are not yet certain that most of the methods measure the same thing as the biological values found by tests on experimental animals. The latter is, of course, the value of prime interest to nutritionists. In numerous instances, either of a given food or of a vitamin in a variety of foods, good correlations between chemical and biological assays have been made. There is still much work to be done, and the laboratory animals have by no means been discarded except, perhaps, in the case of the guinea pig for vitamin C assay.

Despite their imperfections, the chemical methods have made possible rapid progress in our knowledge of the vitamin contents of natural products and have made available quick answers to questions concerning the effects of food processing upon the vitamin potency. They have also made practical the routine control of the uniformity of distribution of vitamins which the manufacturer adds to foods for restorative or fortification purposes.

# Use of Yeast in Vitamin Control

## Yeast is a source of enrichment ingredients and it is also used in determination of $B_1$

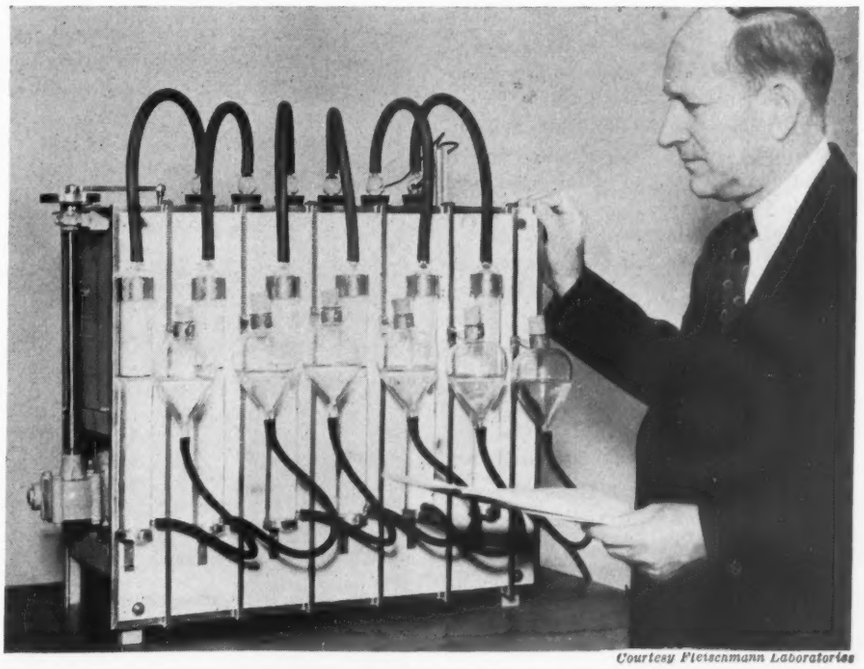
By LAWRENCE ATKIN, ALFRED S. SCHULTZ and CHARLES N. FREY, *The Fleischmann Laboratories, Standard Brands, Inc., New York, N. Y.*

YEAST enters into consideration in vitamin control in the food industries from two different angles. It is a natural source of vitamins, particularly the water-soluble B vitamins, and a specially grown yeast rich in vitamin $B_1$ has been employed to enrich numerous food products. When used in this manner the yeast may be said to serve as a vehicle for vitamin additions. The other use of yeast in vitamin control concerns its part in the yeast fermentation method for the determination of vitamin $B_1$.

If yeast is to be used as a vehicle for the vitamin enrichment of foods it may be obtained in a variety of forms and in a variety of potencies. Powdered dry yeast may be had in potencies ranging from 50 to 200 International Units of vitamin $B_1$ per gram. This kind of yeast has been used in a wide variety of foods as well as in numerous pharmaceutical preparations. Another type of yeast which has achieved great importance as a vitamin carrier is the so-called "Hi-$B_1$ Bakers' Yeast." This yeast was first announced to the baking industry in 1937. It contains over 30,000 I.U. of vitamin $B_1$ per pound, and consequently when used in an amount equal to 2 percent of the weight of flour, it produces a white loaf of bread having a vitamin $B_1$ content of 450 I.U. per pound. This figure, 450 I. U. per pound, represents the average $B_1$ content of bread made with whole wheat. A great deal of interest was aroused by the possibilities inherent in this new yeast, especially in reference to improving the nutritive properties of bread. The interest spread from the baking industry to allied fields. Wheat millers and students of human nutrition became aware of the probable beneficial effect of vitamin-enriched bread towards the end of 1940 when this Hi-$B_1$ bread was being produced at the rate of a half-billion pounds per year. Finally in 1940, the National Research Council, through its Committee on Nutrition, took up the matter. This committee has recently promulgated a set of definitions for vitamin enriched bread and enriched flour which has received widespread publicity. In compliance with these definitions the high $B_1$ yeast was used as a base for an enriched yeast which was promptly made available to the baker. It contains, in addition to a high vitamin $B_1$ content, nicotinic acid and iron. The minimum standard for enriched bread calls for 1 mg. (333 I.U.) of vitamin $B_1$ per one pound loaf, 4 mg. of nicotinic acid and 4 mg. of iron per pound of product. The use of 1.5 percent of the enriched yeast (based on the flour) enables the baker to meet these minimum requirements for enriched bread. The use of 2 percent of yeast on the same basis produces a loaf which approximates whole wheat bread in the constituents mentioned above.

Successful quality control on the part of the yeast making industry has always been a bulwark to quality control in the bread making industry. In spite of the perishable nature of yeast, the yeast manufacturer has succeeded in providing the baker with a uniform product, and to this more than any other single external factor the baker owes his ability to produce, day after day, the same high quality bread his customers have learned to expect. Enriched yeast has the same uniform properties which are displayed by regular bakers' yeast, and consequently quality control with respect to vitamin enrichment rests on the same firm basis. As one baker using enriched yeast recently remarked, "If the dough doesn't rise normally then I know the operator hasn't put in the proper percentage of yeast. If it does rise normally then we know that the yeast and consequently the vitamins are present in proper amount."

Coincidental with the development of high-vitamin yeast, the Fleischmann Laboratories developed a rapid method for the determination of vitamin $B_1$. This



*Courtesy Fleischmann Laboratories*

**Charles N. Frey and apparatus developed by him and his associates for determining the vitamin $B_1$ content of foods in a few hours. Assay with animals would take eight weeks or longer. Mr. Frey is director of Fleischmann Laboratories, New York.**

method, known as the yeast fermentation method, is an important factor in vitamin control. It is based on the discovery, made in 1936, that under suitable conditions the rate of alcoholic fermentation by yeast is remarkably stimulated by the presence of a small quantity of thiamin. Since its inception the yeast fermentation method has been steadily refined, and today it is gaining widespread recognition as an accurate and convenient procedure. A basal solution of sugar, buffer and salts has been developed which undergoes rapid fermentation when an approximate quantity of yeast is added. The addition of a few micrograms of thiamin, however, will cause the rate of fermentation to double itself. The fermentation stimulation caused by a decoction of the unknown is compared with that produced by known quantities of pure thiamin, and in this way the thiamin content of the unknown is determined.

The rate of fermentation is measured by an instrument which is called a fermentometer, shown in an accompanying illustration. A fermentometer consists of a water bath, a shaking device and a battery of gasometers. The water bath is maintained at a constant temperature of 30 deg. C. The shaking device shakes the fermenting solutions, contained in ordinary bottles, so that the carbon dioxide produced as a consequence of fermentation will be given off uniformly and pass to the gasometers where its volume is measured. A complete fermentation test takes three hours.

One of the most recent refinements of the fermentation method is the sulfite modification. It was discovered that, when thiamin is cleaved by the action of sulfite, the cleavage products are incapable of stimulating fermentation. This is a highly specific reaction. If the fermentation activity of a substance is measured before and after treatment with sulfite the difference represents the true thiamin content of the unknown. The small residue of fermentation activity unaffected by sulfite treatment is considered to be non-vitamin in nature.

The yeast fermentation method has been successfully applied to virtually every type of food known to man. It is perhaps superfluous to point out that rapid and reliable methods of vitamin determination are essential to any program of quality control when the vitamin content of the food product is the subject of advertising or promotion, and further the importance of reliable and rapid methods cannot be overemphasized in view of the supervision which the government laboratories will make in connection with all food products carrying vitamin claims.

# Control of Nicotinic Acid In Flour and Bread

## Chemical method developed which accurately measures amount of nicotinic acid in the enriched product

By BERNARD L. OSER, DANIEL MELNICK and LOUIS SIEGEL,* *Food Research Laboratories, Long Island City, N. Y.*

THAT the new synthetic vitamins would ultimately be used on a major scale for the nutritional enhancement of some of our more refined foods was almost a foregone conclusion. Deficiencies of the average American diet in factors constituting the vitamin B group are common. The program for the enrichment of white flour and bread has recently received considerable impetus as a national defense measure. In taste and appearance the fortified foods are not distinguishable from the ordinary products. The vitamins employed in the enrichment of breads are thiamin (vitamin $B_1$), nicotinic acid (antipellagra vitamin) and in some cases riboflavin.

Inasmuch as vitamins are susceptible to destruction or loss from a variety of causes, it becomes necessary to test the baked product for vitamin content even though known amounts of the factors may have been added to the flour or to the dough mix. The difficulty, time and expense involved in biological assays have made it imperative that relatively simpler chemical and bacteriological technics be found. Such methods have been especially lacking for the estimation of nicotinic acid.

To meet this situation, the present investigation was undertaken by Doctors Melnick, Oser and Siegel at the Food Research Laboratories. A chemical method was developed which accurately measures the nicotinic acid content of both natural and fortified breads and flours. The procedure involves water extraction of the anti-pellagra vitamin under steam pressure, conversion of the nicotinic acid compounds to the free acid form, and measurement in a photoelectric colorimeter of the yellow color developed when the vitamin is allowed to react with cyanogen bromide and aniline. Evidence has been accumulated to prove the specificity of this new chemical method for nicotinic acid in flour and bread. Studies on ordinary breads, and on breads made with enriched flour or with high-vitamin yeast, show only small losses of nicotinic acid during fermentation and baking.

Data up to the present time on the nicotinic acid content of flour and bread have been meager and unsatisfactory. The present study has indicated that whole wheat bread contains from 14 to 20 mg. of nicotinic acid per pound loaf. It is suggested that white bread which normally contains from 4 to 6 mg. per pound should be enriched to the whole wheat level. A pound of bread would then contain approximately one-and-one-half to two times the daily requirement of nicotinic acid. This is comparable to the level suggested by many for fortifying white bread with vitamin $B_1$, which also approximates the whole wheat value. More extended studies in the Food Research Laboratories have indicated that with the new chemical method it is possible to determine accurately the uniformity of distribution of the added antipellagra vitamin in bread ingredients such as flour and yeast, its fate during fermentation and baking and how much remains in the finished product.

* From a paper presented before the American Chemical Society, St. Louis Meeting, April 7-12, 1941.

*Courtesy Merck & Co., Inc.*

Isolation of a vitamin.

### More to Come

Additional material on vitamin control will be published in the July issue. Included in this will be "Methods of Determining Vitamin $B_1$ in Foods," by Earl D. Stewart.—THE EDITORS.

# How To Cure the Quick Cure

**Quick curing of hams has great economic advantage. But unless properly used it produces an inferior product. Here are some tips**

By E. S. HURD, *Consulting Chemist and Meat Specialist, Richmond Hill, N. Y.*

ADOPTED generally in the meat packing industry within the last five years, quick curing of hams is apparently here to stay, consumer complaints about the quality of the product notwithstanding. Quick curing is a boon particularly to the small packer. With it he can now cure his own boiling hams. But with the old 90-day cure he could afford neither the space nor the investment required to carry enough hams for his needs. And he faced the same situation in curing hams for smoking.

So quick curing admittedly has a decided advantage. But, unfortunately for individual packers and for the whole meat industry, the method has, in all too many instances, been improperly used. The result has been watery meat, with an anemic color and insipid flavor—a product that has made many a customer inquire, "Where can I get some good ham?"

A case in point is an actual experience of the author. Some years ago he was faced with a rush "order" to change the process from a long cure for hams that were canned to a quick cure which would provide a quicker turnover of the packer's green hams and also give a lower cost product. The quick cure was adopted before there had been time to thoroughly work out the process, with the result that a product which had formerly enjoyed a good consumer demand suddenly lost its market. The trouble was too low a concentration of the curing ingredients, and consequently too great a volume of these ingredients. The finished product showed too much moisture in the can when processed and suffered a high shrink. Nor was the flavor right. The difficulty was later corrected by following principles which are outlined in the following paragraphs.

The quick curing of hams and picnics is accomplished by the use of a solution of salt, sugar and sodium nitrate or sodium nitrite, either, or both in combination. This solution is then forced into the tissues of the meat by means of a pump, which may be accomplished by one of two methods, known as spray

E. S. HURD

pumping or vein or artery pumping. The latter method is probably more generally used because of quicker results. This method may be, and no doubt is, greatly overdone in some instances. But it can give excellent results if properly controlled by chemical analysis. It does not follow that, say, 10 percent of water is added when 10 percent of the weight of the ham is injected into the meat. For the original moisture content and the protein value must be taken into account. The proper ratio can be determined only by analysis. That is the way the Bureau of Animal Industry and some municipalities determine whether or not the regulations governing added moisture have been complied with.

The efforts of the packer are largely directed toward producing a mild and not too salty ham. In order to do this he reduces the concentration of his curing solution, with the result that he must use more volume, and this is what makes a wetter ham.

Why not use a more concentrated solution and less of it? Your ham will cure faster and not be too salty either. The flavor will be much improved, as will also the keeping qualities. Very wet hams will not keep well, since the additional moisture and lower salt content induce attack by bacteria.

In order to do this successfully a careful adjustment of the concentration of the curing solution must be made to harmonize with the volume employed. Concentration and volume must be in equilibrium. Too much water tends to retard rather than promote the absorption by the meat tissues of salt and other curing ingredients, and also to dissolve more of the proteins. Two things cannot occupy the same space at the same time. The time element is also an important factor in adjusting a successful cure.

### *Example of Faulty Technic*

The data in the accompanying table are a good illustration of the results of faulty technic. All of the 12 test hams listed are in violation of the B.A.I. regulation.

After all, if the regulation governing

(*Turn to page* 114)

**Data Showing Results of Adding Too Much Moisture in Quick Curing Hams.**

(*All* **12** *of these test hams are in violation of B.A.I. regulations*)

| Date in cure | No. of hams | Percent of pickle* | Strength of pickle | Date out of cure | Green wt. (lb.) | Pumped wt. gain | Pulled wt. gain or loss | Smkd. wt. gain or loss | B.A.I. added moisture† |
|---|---|---|---|---|---|---|---|---|---|
| 1/8 | 1 | 10 | 75° | 1/9 | 14.8750 | 11.7647% | 13.0254% | + 7.5629% | 9.9338% |
| 1/8 | 1 | 17 | 60° | 1/9 | 14.1875 | 17.6210% | 18.0614% | +12.7752% | 15.0137% |
| 1/8 | 2 | 10 | 75° | 1/10 | 14.6250 | 12.8204% | 13.2263% | + 4.2735% | 5.7598% |
| 1/8 | 2 | 17 | 60° | 1/10 | 14.5625 | 14.5064% | 16.7383% | + 1.2875% | 6.4713% |
| 1/8 | 3 | 17 | 60° | 1/11 | 14.5000 | 18.1034% | 17.6722% | +10.3448% | 11.7353% |
| 1/8 | 3 | 10 | 75° | 1/11 | 14.3125 | 10.0437% | 9.1702% | + 1.3100% | 2.4919% |
| 1/8 | 4 | 17 | 60° | 1/12 | 14.8750 | 16.3862% | 15.1259% | +10.9239% | 14.4976% |
| 1/8 | 4 | 10 | 75° | 1/12 | 14.1250 | 10.6194% | 10.6194% | + 4.4248% | 9.8940% |
| 1/8 | 5 | 17 | 60° | 1/15 | 14.6250 | 16.4309% | 14.9573% | +11.1109% | 7.3892% |
| 1/8 | 5 | 10 | 75° | 1/15 | 14.3750 | 10.4337% | 8.2607% | + 4.3488% | 14.0408% |
| 1/8 | 6 | 17 | 60° | 1/16 | 14.0625 | 17.7775% | 16.4441% | +12.0709% | 9.1714% |
| 1/8 | 6 | 10 | 75° | 1/16 | 14.5625 | 11.5878% | 9.8712% | + 4.7209% | 7.8420% |

* By volume.
† Added moisture content as determined by Bureau of Animal Industry methods.

# Corn Sirup Solids Improve Frozen Dairy Products

**Give better body and texture in ice creams, sherbets and ices, without significantly changing sweetness, when used to replace part of sucrose normally employed***

By LYNN R. GLAZIER and MERRILL J. MACK, *Massachusetts State College, Amherst, Mass.*

ADDED sweetening agents make up a large percentage of the food solids of frozen dairy products. They comprise about 40 percent of the solids of ice cream and a considerably higher percentage of the solids in ices and sherbets. During the World War sucrose became difficult to obtain, and in 1918 ice cream manufacturers were allowed only 80 percent as much sucrose as in the previous year. In view of this situation, the manufacturers of ice cream were forced to employ other sweeteners besides sucrose. Such products as invert sirups, corn sirup and dextrose were used to replace sucrose as reference to the literature shows.[1,2]

The dextrose and sirups available at that time were not entirely satisfactory in color and flavor, but continued investigation by the manufacturers of these products brought about considerable improvement in the quality of the existing corn sweeteners and led to the development of new products which are satisfactory as to color and flavor. The interest of the frozen dairy products industry in corn sweeteners has been stimulated considerably by these improvements in quality, and their use is steadily increasing. This interest is doubtless due in part to the increased knowledge of the advantages such corn sweeteners contribute to ice cream, ices and sherbets when employed in combination with sucrose.

The corn sweeteners now in use in frozen desserts are dextrose, corn sirups and corn sirup solids. A number of investigators have published material about the use of dextrose in ice cream.[3,4,5,6,7] Information is also available about a different type of corn sirup, an enzyme converted high conversion corn sirup, which is on the market.[8,9] Very little information, however, has been published concerning corn sirup solids. For this reason, a study of this sweetener has been conducted at the Massachusetts State College.

Corn sirup solids result from the dehydration of corn sirup to a stable, white product, which in outward appearance resembles confectioners sugar. Hellwig and Buchanan[10] report that this sweetener has a dextrose equivalent of 42.5, a moisture content of 3.5 percent and a pH of 5.1. The carbohydrates present in corn sirup solids are dextrose, maltose and dextrines in the ratio of 21:33:43.

**Fig. 2. Effect of sugar combinations on the development of sucrose crystals in ices and sherbets. Top row, ices. Bottom row, sherbets. Exposed in hardening room for five days. (1) 28 percent sucrose. (2) 21 percent sucrose + 7 percent corn sirup solids. (3) 21 percent sucrose + 7 percent dextrose.**

### *Purposes and Plan of Study*

There were two principal objectives of this investigation. The first was to determine the effect of corn sirup solids on the flavor, body and texture, and other characteristics of frozen desserts. The second objective was to determine, by consumer tests, the relative sweetening value of the common corn sweeteners when used in ice cream.

Ice creams sweetened with sucrose were compared with others which contained corn sirup solids as a replacement of part of the sucrose. Most of the work was done with replacements of 20, 26⅔ and 33⅓ percent of the sucrose by the corn sirup solids. In addition, several sets were made in which dextrose and high conversion corn sirup were used, as well as corn sirup solids.

Ordinary commercial methods were used in processing and freezing the ice creams. When the sugar content was the only variable in the mixes, one large batch was made containing all the in-

* Contribution No. 405 of the Massachusetts Agricultural Experiment Station.

gredients except a part of the sugar. The large batch was then heated and split into smaller batches; the desired kind and quantity of sugars were added to the smaller batches, which were then brought to the same temperature and homogenized, cooled and aged in the same way. In this manner, series of mixes were prepared in which the only variable was the sugar. In freezing the ice cream, counter, batch and a continuous freezer were used.

The dairy products used in the mixes were sweet cream, whole or skim milk, and skim milk powder. The mixes varied in fat content from 10 to 18 percent fat. The mixes were tested for acidity by titrating with O.1*N* NaOH, using phenolphthalein as an indicator. Freezing points of the mixes were determined by the Hortvett cryoscope equipped with a Beckman thermometer graduated to 0.01 deg. C. Viscosity determinations were made with a McMichael viscosimeter and readings were expressed in terms of a No. 30 wire.

Ices and sherbets were prepared to determine the suitability of corn sirup solids in these products. The sweetening was as follows: (1) 28 percent sucrose; (2) 21 percent sucrose plus 7 percent dextrose; (3) 21 percent sucrose plus 7 percent corn sirup solids. Gelatine was used as the stabilizer; fruit acid and flavor were added at the freezer. When milk sherbets were made, 20 percent by weight of ice cream mix was added to the ice base at the freezer.

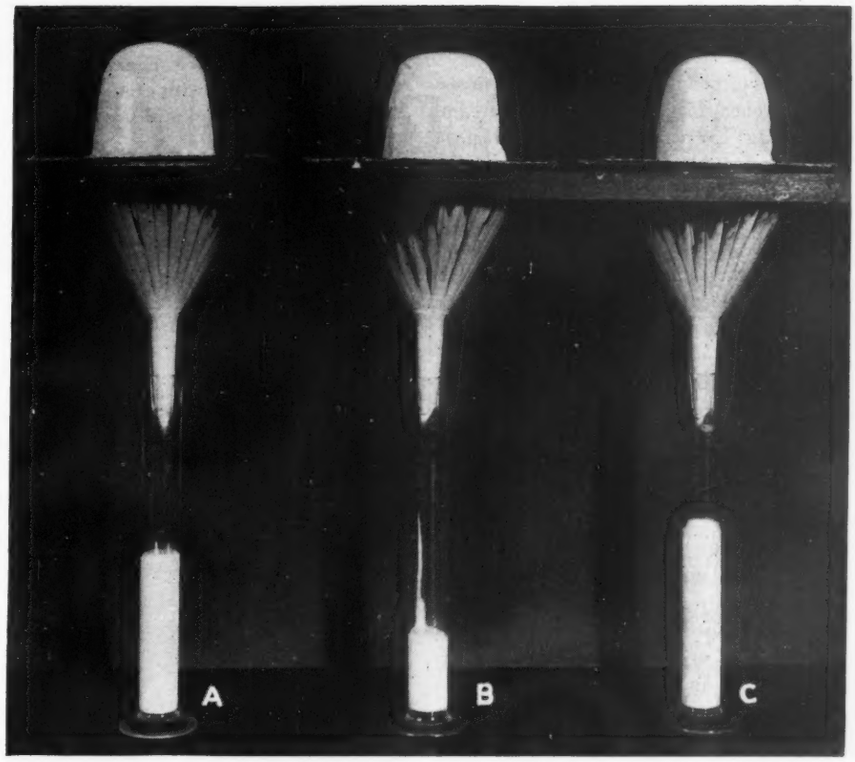



**Fig. 1. Rate of melting of ice creams containing corn sweeteners. (*A*) 11 percent sucrose + 4 percent dextrose. (*B*) 11 percent sucrose + 4 percent corn sirup solids. (*C*) 11 percent sucrose + 4 percent enzyme converted corn sirup.**

**Table I—Effect of Corn Sirup Solids On Some Properties of Ice Cream Mix.**

| Mix No. | Sugar content | Freezing point, deg. C. | Viscosity, deg. M. | Titratable acidity, percent | Protein stability, c.c. |
|---|---|---|---|---|---|
| 1 | 15% sucrose | −2.259 | 249 | .182 | 4.25 |
| 2 | 12% sucrose plus 3% corn sirup solids | −2.273 | 279 | .190 | 4.25 |
| 3 | 11% sucrose plus 4% corn sirup solids | −2.202 | 271 | .191 | 4.25 |
| 4 | 10% sucrose plus 5% corn sirup solids | −2.134 | 285 | .189 | 4.25 |

**Table II—Comparative Whipping Ability of Sucrose Mixes and Part Corn Sirup Solids Mixes When Frozen in Different Freezers.**

| Mix composition | Type of freezer used—Percent overrun: Counter | Brine batch | Direct expansion batch | Continuous (mix pressure) |
|---|---|---|---|---|
| 1. 15% sucrose..... | 87.5 | 90.0 | 93.5 | 54 |
| 2. 12% sucrose plus 3% corn sirup solids.... | .... | 89.0 | 96.75 | 59 |
| 3. 11% sucrose plus 4% corn sirup solids.... | 83.5 | 88.5 | 100.25 | 62 |
| 4. 10% sucrose plus 5% corn sirup solids.... | .... | 86.0 | 98.25 | 66 |
| 1. 15% sucrose plus 10% serum solids..... | 83.0 | 96.0 | 90.5 | 60 |
| 2. 11% sucrose, 4% corn sirup solids, 10% serum solids..... | 85.0 | 99.5 | 97.0 | .. |
| 3. 11% sucrose, 5% corn sirup solids, 9% serum solids..... | 86.0 | 95.5 | 95.0 | 68 |
| 4. 11% sucrose, 6% corn sirup solids, 8% serum solids..... | 90.0 | .... | 94.5 | .. |

### *Properties of Ice Cream Mix Containing Corn Sirup Solids*

The effect of partial replacements by corn sirup solids on some properties of ice cream mix is shown in Table I. The freezing point of ice cream is lowered less by corn sirup solids than by sucrose. In this respect the sweetener differs from dextrose and high conversion corn sirup, as both of these products lower the freezing point more than sucrose and hence tend to produce a relatively soft ice cream. Frozen desserts containing corn sirup solids are firm and melt less readily.

The viscosity of ice cream mix is increased slightly by the use of sucrose and corn sirup solids as sweeteners, rather than sucrose alone. As is shown in Table I, replacements of from 20 to 33⅓ percent of the sucrose of the mix result in a viscosity increase of about 10 percent. The viscosity increase is not sufficiently marked to require a reduction in the amount of stabilizer needed, or any other change in the composition of the mix.

The titratable acidity of the mix is increased very slightly by the use of corn sirup solids. The change, however, is not sufficient to be of any commercial significance; it is not sufficient to affect the stability of the proteins when corn sirup solids are used. This is evident from the data in Table I.

An examination of Table II reveals that mixes containing a combination of sucrose and corn sirup solids whip fully as well as those containing sucrose as the sole sweetening agent. While some mixes containing corn sirup solids whipped slightly slower than the all-sucrose mixes in a counter freezer and brine batch freezer, other mixes of a similar composition did not. All mixes containing corn sirup solids invariably whipped better in a direct-expansion freezer than the mixes sweetened by sucrose alone. From the data secured, it is evident that mixes containing corn sirup solids average to whip as well as those containing sucrose only, provided they are all frozen to the same stiffness. The whipping time of the two types of mixes may, however, vary somewhat from one make of freezer to another.

The figures in the last column of Table II are the pressure readings on the mix line of a Vogt junior continuous freezer. Since the speed of the milk pump is constant on this machine, and since the temperature of the refrigerant remained the same throughout, these figures show that a stiffer ice cream resulted from the replacement of sucrose by corn sirup solids in mixes 2, 3 and 4.

### *Flavor, Body and Texture Of Ice Creams*

Groups of people were asked to express a preference for samples of ice cream containing 15 percent sucrose, 12 percent sucrose plus 3 percent corn sirup solids (20 percent replacement), or 11 percent sucrose plus 4 percent corn sirup solids (26⅔ percent replacement). Those observing the samples did not know their identity. The groups contained students specializing in Dairy Industry and Food Technology, members of the faculty, secretaries, janitors, and so on. Since students specializing in dairy and other foods courses made up a goodly share of the judges, it is logical to assume that the judges were somewhat more critical than average consumers. The preferences of these consumers are summarized in Table III.

The data in Table III reveal that consumers saw little difference in sweetness between ice creams containing 15 percent sucrose and 12 percent sucrose plus 3 percent of corn sirup solids. The ice cream containing the combination of sweeteners was preferred by more of the consumers than was the control, and was also judged to be preferable in body and texture.

When the replacement of corn sirup solids for sucrose was increased to 26⅔ percent, as in the second part of Table III, more of the consumers chose the all-sucrose ice cream as being sweeter than that containing the combination of sugars. However, many more of the judges expressed a preference for the ice cream containing both the sucrose and corn sirup solids. This ice cream was also preferred in body and texture by the majority of consumers.

An analysis of the consumer judgments leads to the conclusion that the replacement of 20 and 26⅔ percent of the sucrose improves the flavor, body and texture of ice cream, with no significant change in sweetness.

The information in Table III was obtained from vanilla ice creams. Other flavors were made from the different mixes, including chocolate, strawberry and other fruit ice creams. For the most part, consumers saw very little difference in the flavor of these ice creams when corn sirup solids were used to replace a part of the sucrose. The combined sugars produced a firmer and smoother ice cream than did sucrose alone.

The melting appearance of ice creams containing corn sirup solids is satisfactory, and differs from that containing other corn sweeteners only in the rate of melting, which is slower, as is shown in Fig. 1. Since the ice creams containing corn sirup solids are firmer, they naturally melt somewhat more slowly. The increased firmness obtained by the combination of the sweeteners affects favorably the amount of shrinkage occurring in dishing ice cream. The data in Table IV clearly show this. When ice cream containing sucrose alone was compared with that containing 4 percent corn sirup solids (replacing 26⅔ percent of the sucrose), the dipping shrinkage was materially decreased in 10 percent fat ice cream. As the fat content of the mix was increased, the difference in dipping shrinkage was less marked. According to Tracy,[4] dextrose has the opposite effect.

**Table III—Summary of Consumer Comparisons of Ice Creams Containing Sucrose with Ice Creams Containing Sucrose and Corn Sirup Solids.**

| Sugar content | Body and texture preferred by | Placed sweeter by | Preferred by | Saw no difference in: Body and Texture | Saw no difference in: Sweetness | Saw no difference in: Preference |
|---|---|---|---|---|---|---|
| 15% sucrose.. | 61 | 100 | 106 | 9 | 32 | 33 |
| 12% sucrose plus 3% corn sirup solids.. | 81 | 83 | 124 | 9 | 32 | 33 |
| 15% sucrose.. | 92 | 215 | 223 | 32 | 36 | 72 |
| 11% sucrose plus 4% corn sirup solids.. | 218 | 134 | 277 | 32 | 36 | 72 |

**Table IV—Effect of Sucrose and Corn Sirup Solids on the Dipping Shrinkage of Ice Cream.***

| Sugar content | Fat percentage of mix: 10% | 14% | 18% |
|---|---|---|---|
| | Percent of shrinkage | | |
| 1. 15% sucrose..... | 31.3 | 27.1 | 22.5 |
| 2. 11% sucrose plus 4% corn sirup solids..... | 26.5 | 25.9 | 21.5 |

* The ice creams were held at constant temperature in a sales cabinet. Dipping was into pint Sealright cartons. A standard flat-bowled ice cream dipping spoon was used.

**Table V—Consumer Placings of Ice Creams Containing Different Sweeteners.**

| Sugars used | Placed sweetest, by percent | Body and texture preferred, by percent | Preferred, by percent |
|---|---|---|---|
| 1. 15% sucrose..... | 27.7 | 22.8 | 22.9 |
| 2. 11% sucrose plus 4% dextrose..... | 25.6 | 24.8 | 26.8 |
| 3. 11% sucrose plus 4% enzyme converted corn sirup..... | 21.7 | 22.4 | 21.8 |
| 4. 11% sucrose plus 4% corn sirup solids..... | 25.0 | 30.0 | 28.5 |

**Table VI—Effect of Corn Sweeteners on Melting Rate of Ice Cream.**

| Length of exposure at 75 deg. F. | Amount of drainage from pints of ice cream: 1 — 11% sucrose, 4% dextrose c.c. | 2 — 11% sucrose, 4% high conversion corn sirup c.c. | 3 — 11% sucrose, 4% corn sirup solids c.c. |
|---|---|---|---|
| 60 min..... | 45 | 60 | 18 |
| 75 min..... | 100 | 96 | 58 |
| 90 min..... | 140 | 135 | 100 |
| 105 min..... | 210 | 195 | 170 |
| 120 min..... | 260 | 245 | 215 |

### *Comparison of Corn Sweeteners*

Ice creams containing 15 percent sucrose were compared with others containing dextrose, high conversion corn sirup or corn sirup solids to replace 26⅔ percent of the sucrose. These were judged by 224 consumers, who rated them in sweetness, body and texture, and preference. The figures were not markedly different, as an examination of Table V reveals. From these results it appears that, so far as the sweetness perception is concerned, the corn products are in the following order: Dextrose, corn sirup solids, high conversion corn sirup. However, in body and texture preference, the consumers chose corn sirup solids, followed by dextrose and high conversion corn sirup. The all-sucrose sweetened ice creams were rated last in body and texture and preference.

The rate of melting of ice cream is affected by the type of corn sweetener used. This is shown by the data in Table VI. An examination of these figures indicates that dextrose and high conversion corn sirup produce a relatively soft, fast-melting product as compared with corn sirup solids. In each case the ice creams showed no undesirable foamy, rough or clotted appearance. The only difference was in the rate of melting.

(*Turn to page* 114)

#### References


1. J. H. Frandsen, J. W. Rovner and J. Luithly, Sugar Saving Substitutes in Ice Cream. Nebraska Agricultural Experiment Station Bulletin No. 168, 1918.
2. S. H. Ayers, O. E. Williams and W. T. Johnson, Jr., Sugar Substitutes in Ice Cream Mix. *Ice Cream Trade Journal* 14, No. 4, 29, 1918.
3. M. J. Mack, Defects of High Solids Mixes and Their Cure. *Ice Cream Field* 27, No. 3, 24, 1935.
4. P. H. Tracy, Corn Sugar. *Ice Cream Trade Journal*, p. 30, Feb., 1936.
5. H. H. Sommer, The Theory and Practice of Ice Cream Making. Published by the author, Madison, Wis., 1932.
6. A. C. Dahlberg, New Developments in Methods Used in Making Ices and Sherbets. *Ice Cream Trade Journal*, p. 41, April, 1930.
7. R. J. Cooley, W. H. E. Reid and W. C. Hall, Replacing Cane Sugar with Variable Increments of Dextrose Sugars and the Effect Upon the Physical and Chemical Properties of Ice Cream at Different Serving Temperatures. Paper presented at annual meeting, American Diary Science Association, June, 1940.
8. A. C. Dahlberg and E. S. Penczek, Dextrose and Corn Sirup for Frozen Desserts. New York State Agricultural Experiment Station Bulletin No. 696, October, 1940.
9. P. H. Tracy and George Edman, Tests of Enzyme Converted Corn Sirup Reveal Desirable Properties. *Food Industries* 12, No. 12, 43, 1940.
10. A. P. Hellwig and B. F. Buchanan, Freezing Point Data on Corn Sirup Solids. *Ice Cream Trade Journal*, February, 1940.

# How the British Make Jams

**Part II—Raw materials and their preparation—Making the sirup—How boiling is carried out—The efficient semi-automatic system—Finishing**

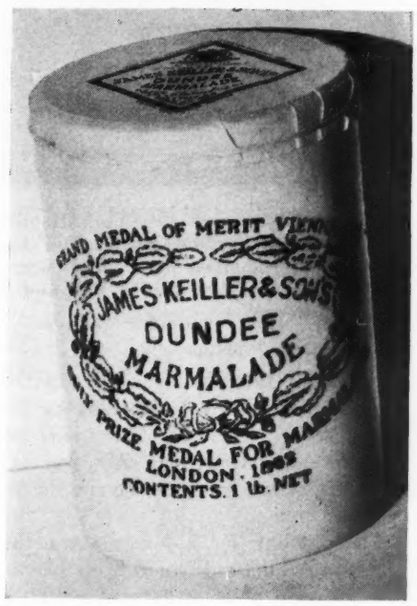
By H. B. CRONSHAW, *London, England*

### *The Raw Materials*

THE difficulties of the jam maker begin with the selection of the fruit. For one thing, he has to manufacture a uniform product from a raw material subject to variations due to weather, cultivation, and so forth. Furthermore, the fruit may be fresh, frozen, chilled, canned or sulphited. This is where experience counts, especially when it brings in the practice of blending.

Taking any particular kind of fruit, some varieties are more suitable for jam making than others. In the case of strawberries, for example, a full-flavored fruit is required that will remain whole and retain its bright color during the process of manufacture. Although it is known in a general way which varieties of fruit are unsuitable and which are suitable, the jam making quality of fruit varieties is a subject which does not appear to have been systematically investigated, as has been done on behalf of the canning quality of fruits. Nor have any standards been laid down. At the same time it should be pointed out that although high-quality fruit is required for high-quality jams, good wholesome products can be made from fruit which does not reach this standard. And, in fact, much of this fruit represents the surplus of the fresh fruit and canning markets. Also, as previously mentioned, a large part of the fruit used for jam making is not fresh fruit, but has been preserved by canning and bottling, or by sulphiting or freezing.

In Britain a large proportion of jam is made from fruit which has been preserved by means of sulphurous acid or other sulphites. The sulphited "pulp" is stored in casks in a cool, sheltered place, and is tested now and then for its $SO_2$ content, and any deficiencies remedied. Also, before use the pulp is examined to see if there are any signs of fermentation as evidenced by bubbles of gas or by the return of the natural color of the fruit through loss of $SO_2$. Sulphurous acid is also used to safeguard fresh fruit against attack by yeasts and molds if for some reason it has to be kept a day or two before being turned into jam. About 1 pint of 6 percent acid to each hundredweight of fruit is sufficient for this purpose.




**A famous old British marmalade packaged in a 1-lb. crock and covered with parchment held in place by string. The product of James Keiller & Son's, Dundee, Scotland, it won a prize medal in London in 1862 and the Grand Medal of Merit in Vienna in 1873.**

### *Only Sound Fruit Used*

There is one golden rule that applies generally to all classes of fruit—and, in fact, to all classes of food products in which fruit is used. That rule is: Only good, sound, clean fruit should be used, and the sorting must be thoroughly carried out. This means the removal of dirt, stalks and leaves as well as unripe, diseased, hard or otherwise unsuitable fruit. Certain fruits also require special treatment. Black currants must be "strigged," gooseberries "snibbed" and strawberries "plugged." Sometimes the stones are removed from plums and cherries, and the pips from berry fruits.

Apart from the removal of plugs (caps in the United States) from strawberries by hand, there has been an increasing tendency to employ special machines for these operations. In the cleaning and trimming of plums, gooseberries, black currants, and red currants (if sufficiently hard), a strigging machine or a picking machine is largely employed for removing dirt, stalks and leaves. Both perform the same functions, but the picking machine is a more recent development and has certain advantages over the strigger, including a larger output. Tests on black currants have given an output of a quarter of a ton per machine per hour for an inclined reciprocating screen, through the interstices of which mechanical fingers rotate at the combined rate of 200,000 revolutions per minute.

For topping and tailing gooseberries, a snibbing machine is widely used by means of which over a ton an hour can be snuffed, tailed and cleaned. It consists of a vertical cylinder lined with carborundum; at the top is a hopper through which fruit and water are fed, while the bottom is formed by a revolving plate of carborundum. This machine will also clean plums.

Another widely used piece of equipment which may be mentioned here is the fruit-pulping machine employed for extracting stalks, stones, pips, seeds, and soforth, from all kinds of fruit. This consists of an inclined cylindrical sieve (of any desired mesh) through which the fruit is passed by revolving brushes. Refuse is delivered at one end and pulp at the other, or at a more suitable point. The mechanical construction of these machines has in recent years been much improved to ensure silent running at comparatively high speeds and to safeguard the fruit from oil contamination and the gears from attack by fruit acids.

In the preparation of marmalade, special peel-cutting machines are used. These slice the orange (or lemon) peel into coarse chips or fine shreds. In the

latter case the red rind of the peel is shredded after stripping and discarding the white pith.

Sugar (either cane or beet), the other main ingredient of jam, is best used in the form of a 66 percent sirup (*i. e.*, 100 lb. sugar dissolved in 5 gal. of water). This is separately prepared in a stationary steam-jacketed pan (of, say, 4- or 6-cwt. capacity) built for a high steam pressure of 150 lb. or a low pressure of 60 lb. per square inch. A sluice valve at the bottom of the pan enables the content to be withdrawn for filtering and thence taken to the boiling pans. When working on the batch system, a sirup pan is arranged to feed each boiling pan.

About 30 to 40 percent of the sugar in the finished jam should be in the invert condition. This may be secured by inverting a separate portion of the sirup and then mixing to the required extent with the sucrose sirup, allowance being made for the inversion taking place during the boiling and finishing of the jam. As already mentioned, the extent to which inversion has proceeded in the finished jam has to be constantly checked up by application of Lane and Eynon's test. If inversion has not gone far enough, sucrose is likely to crystallize out on storage; if too far, dextrose may separate out. The addition of citric or tartaric acid, or of fruit juice rich in acid, may be made to increase the amount of inversion in the case of fruit deficient in acid, care being taken to guard against syneresis caused by excessive acidity. Some manufacturers use a certain proportion of glucose (say, up to 15 percent of the weight of the jam).

### *Boiling*

Various types of steam-jacketed pans are in use for carrying out the jam-boiling operation. Formerly they were built of copper; now they are mostly of stainless steel, specially constructed for high steam pressures and rapid boiling (say, 6 to 7 minutes). Common working pressures are 60, 70, 100, 120 and 150 lb. per square inch; common working capacities are 40, 84, 140, 168 and 224 lb. Some types are stationary; others "swing tip." Provision is sometimes made for a removable steam coil inside the pan. Fittings include the usual inlet valves, drain taps, and so forth.

A weighed batch of fresh fruit (preously prepared as already described) or pulp is charged by hand into the pan, water added and the steam turned on. The preliminary cooking is for the purpose of softening the skins and tissues of the fruit, or in the case of pulp to drive

**Raspberry and gooseberry "York House" jam, made in England and packed for R. H. Macy & Co., New York. The closure is removed with the aid of a fork and a patented lift tab.**

off some of the $SO_2$. The duration of this precooking varies according to the nature of the fruit. Black currants require a comparatively long cook, whereas fresh raspberries and strawberries do not need softening.

After boiling for a few minutes, the requisite amount of sugar sirup is run in, and any acid or coloring matter added. Sometimes a little edible fat is added to prevent frothing. The addition of pectin is made near the end of the boil so as to minimize destruction of its setting properties. The amount of pectin used is about 1½ to 4 oz. for first-quality jams and 6 to 8 oz. for second-quality jams, for each 100 lb. of jam.

The end of the boil is judged by the "drop test" in conjunction with the thermometer reading (corrected for variations in barometric pressure). Meanwhile the chemist checks up by his determinations of total sugar and percentage of inversion. It should be noted that the thermometer reading cannot be taken as a reliable indication of the total sugar content as it is affected by the lack of uniformity of the jam and also by the extent of inversion. The experienced jam boiler "finds his jelly" by use of his skimmer in the "drop test" when the temperature approaches 220 deg. F.; then he cuts off the steam and takes his final thermometer reading. Another check on the correctness of the boil is the determination of the finished weight of the batch of jam. When a number of consecutive boilings of the same kind of jam are being made, it should be possible to work by the thermometer alone after the first few boilings have been checked up as described.

### *Semiautomatic System*

The old-fashioned methods of making jam, jellies and marmalade—in which tubs and jelly bags figured prominently—are fast disappearing and being replaced by more efficient processes which employ plants built on modern engineering lines. In same cases obsolete equipment has been only partially replaced, and the result is a curious mingling of past and present. But other concerns have made a clean sweep of the past and are operating on a unified system with an up-to-date plant.

Such a system enables the manufacturer to turn out a product which may be jam, jelly or marmalade, just as he pleases—with great saving in time, labor and production costs, and also with great improvement in uniformity and quality. The manufacturing basis consists of *(a)* the preparation of sugar sirup, invert sugar sirup and fruit puice; *(b)* the piping of these to a point where they can be correctly proportioned by a suitable mechanism and then mixed; *(c)* the piping of the mixture to the fruit contained in rapid boiling pans.

The sirup plant comprises *(a)* a sugar melting pan fitted with stirring gear and closed heating coil, *(b)* a preheating and calibrating tank for delivering a measured volume of water into the melting pan, *(c)* a filter press and *(d)* sirup storage tanks, blow-up and pipe lines.

Sugar is charged into the melting pan and the required amount of hot water added from the adjacent preheating and calibrating tank. After solution is affected, the sirup is run from the pan into a closed cylindrical receiver or blow-up placed below it. Thence the sirup is passed by compressed air through the filter and into the sirup storage tank ready for piping to the pan-charging machine.

The sugar-inversion plant consists of two tanks, into one of which filtered sirup, heated to the appropriate temperature, is blown and allowed to stand until inversion is complete. While sugar is being inverted in one tank, sugar previously inverted is being drawn from the other to the pan-charging machines.

The fruit-juice plant comprises *(a)* a fruit cutting machine, *(b)* juice extraction autoclaves, *(c)* a pulp filter press, *(d)* a mixing receiver, *(e)* a clarifying filter and *(f)* juice storage tanks.

Fruit is cut up in a fruit cutting machine, a vertical type being used for soft fruits and a horizontal type for stone fruits. Stainless steel blades revolve at

high speed through combs mounted on the housing to prevent choking.

The pulp thus obtained is charged into one of the autoclaves which consists of a steam-jacketed vessel constructed of heavy copper, tinned internally and having a capacity of one ton. Each autoclave is fitted with an agitator that is overhead driven through reduction gearing. Alongside the autoclave is a preheating and calibrating tank from which the required volume of hot water is run into the autoclave at the same time as the fruit pulp is charged into it.

After cooking, which normally requires about 15 minutes with a steam pressure of 50 lb. per square inch on the jacket, the content of the autoclave is discharged to a coarse or pulp filter press, of the plate or frame type, through which it is forced by compressed air. Provision is made for discharging the pulp through an opening in the floor when the filter is being cleaned.

From the filter the juice passes below to a mixing receiver provided with stirrer and is there mixed with a filter-aid (diatomite). The stirrer is eccentrically mounted in the lower half of the receiver to prevent air bubbles from being incorporated into the juice, while at the same time giving efficient mixing.

The juice is then blown at a regulated speed and without pulsation through a fine or clarifying filter of the same type as the pulp filter but with narrower distance pieces as the amount of solid material to be removed is much less.

From the clarifying filter, the clear juice passes to a series of storage tanks which are connected by gravity pipe lines to the pan-charging machines.

Proportioning and mixing is carried out by pan-charging machines, each unit of which consists of a cabinet on the top of which are four weighing tanks mounted on automatic balances. Above each tank is a feed pipe fitted with handy control valves whereby they are accurately filled to the required weights with sucrose sugar sirup, invert sugar sirup, dark fruit juice and light fruit juice, respectively. By means of radial self-grinding sluice valves the contents of the tanks are discharged into a copper trough running in front of the tanks. From the trough the mixture of liquids passes into a montejus (an apparatus for elevating the juice by steam or air pressure) which feeds the boiling pans.

The boiling pans are designed for "extra rapid" action. They are provided with a live steam coil in the center and also an external jacket with a steam-distribution coil. By this means a very high rate of heat transfer is obtained whereby 80 to 100 lb. of water can be evaporated in 3 to 5 minutes—which is roughly the amount to be evaporated from a charge of 240 lb. Apart from a saving in time, etc., rapid boiling is conducive to a stronger set and a better flavored product, whether it be jam, jelly or marmalade.

The boiling pans may be of the stationary (not tilting) type and do not need to be fitted with stirring gear. A battery of five pans will give 250 to 300 boilings a day.

In order to prevent splashing due to rapid boiling, the top of the pan is volute in shape, over the top is a closely fitting conical hood provided with an inspection door and a couple of charging doors for fruit. Short ducts connect the hoods to a main steam-collecting duct which runs above each battery of five pans and increases in diameter towards the exhaust fan which discharges the steam through the roof direct to the atmosphere.

After the mixture of sugar sirup (sucrose), invert sugar and fruit juices (in the case of jellies), together with solid fruit (for jam) or cut peel (for marmalade), has been boiled to the required temperature, as indicated by thermometers projecting through the hoods, the product is discharged into carrying bogies made of copper in which it is run to the coolers.

### *Finishing*

Before filling into containers, jam is cooled to about 180 to 200 deg. F., although there is some difference of opinion as to the extent to which cooling should be carried out. If the temperature is too high, the fruit may float; if too low, the set of the jam may not be good.

**Lime and lemon marmalade manufactured in England by Spring & Co., Ltd., expressly for R. H. Macy & Co., New York. According to the label, it possesses "tonic properties."**

Various kinds of cooling devices are in use. They are commonly tables consisting of a tray (copper, aluminum or tinned) mounted on a stand; the tray may have water-cooled channels. Another form is simply a water-jacketed trough. Cooling should require only a few minutes.

In the case of jelly, the slabs from the cooling trays are divided up into tablets of the required size by table-jelly cutting machines.

If the product is jam or marmalade, it is transported in bogies to automatic (or mechanical) filling machines, or to filling tables (sometimes called revolving pouring tables), by means of which the filling is done by hand and which are still largely favored by reason of their low cost and efficiency. Three girls at each table can fill up to four tons of jam a day. The table consists of a circular top mounted on a heavy cast-iron pedestal and capable of being rotated. One girl takes the clean empty jars from the conveyor delivering them from the jar-washing machine (which, in addition to cleaning 1-lb. to 14-lb. jars, removes the labels from returned jars) and stands them around the outer edge of the tables. The second girl fills the product from the bogies into the jars. The third girl places the circles of tissue on the top of the jam or marmalade, removes the filled jars from the table and stacks them on mobile trucks for cooling. The object of the tissues is mainly to retard the growth of molds, and also to protect the jam from insects and dirt. Tissues should be impervious to moisture and should be applied to the jam while hot so as to avoid the formation of air spaces.

Cooling of the filled jars is effected either by allowing them to stand on the mobile trucks or by passing them through a cooling tunnel. Cooling should be as rapid as possible so as to avoid further inversion of the sugar and to preserve the color.

The final operations are closing the jars and labeling. The usual practice is to use either parchment covers or metal caps. The former are simply tied on. Parchment covers are permeable within certain limits to both air and water vapor. When metal caps are used, both they and the head space must be sterilized. This may be done either by inverting the pots of jam immediately after filling, or by steam-sterilizing the upper parts of the filled jars in their upright position.

# Boiler Water Conditioning Avoids Trouble and Expense

**Part II*—Many methods are available for treating boiler feedwater, but only a few have proved suitable for controlling the quality of steam used in food processing plants**

By ROBERT A. CLARKE, *Director of Research, Acme Breweries, San Francisco, Calif.*

THERE is no royal road to good results in boiler water conditioning. These can only be obtained by sustained effort, properly applied. The A.S.M.E. Code has this to say on the subject (paragraph C-210): "The treatment of boiler feedwater is a specialized branch of chemical engineering. The average operating engineer is not qualified to undertake this phase of the work."

"Consequently, in all cases where feedwater treatment is necessary, boiler plant operators should place their problems in the hands of competent technical specialists, abiding by their advice."

Test apparatus and methods have been so developed that they may be applied in the boiler room by reasonably competent help to maintain specified boiler water conditions. For any given set of operating conditions there will be a corresponding set of boiler water conditions which, if carefully controlled between rather liberal limits, will produce satisfactory results.

Take, for example, a boiler operating at 150 lb. pressure. In this particular boiler 2,500 ppm. (parts per million) total solids might be considered allowable. We would want about 270 ppm. equivalent caustic soda, 600 ppm. sulphate, 20 ppm. phosphate, not over 150 ppm. silica, an equivalent pH of 11.0 and should expect a condensate with pH 6.0 to 6.5. In addition we would probably find 300 ppm. sodium carbonate and 100 ppm. chloride. Dissolved oxygen should be substantially eliminated. This will not hold true for every boiler, but it is quite typical and a similar schedule could be prepared for any boiler depending on its design and characteristics, the nature of the load, and the analysis of the feedwater.

Such a schedule, if correctly prepared and adhered to, would keep scale, corrosion, carry-over, and embrittlement to an absolute minimum.

In boilers operating at nominal pressures, such as generally employed in the food industries, the scale has been found to consist largely of calcium sulphate, calcium carbonate, and silicates of calcium and magnesium. Relatively soft carbonate scales occur in the feedwater heater, the feed lines, and in the cooler areas of the boiler where the feedwater first enters the circuit. The ordinary hard adherent scale is found on the evaporating surfaces.

It has been proved that hard scale is formed not by precipitation from the body of the water as a sludge, later to settle and adhere, but actually by crystallization upon the steel directly from solution. This discovery led to the realization that if the composition of the water could be so controlled as to cause the solids thus deposited to form a non-adherent sludge which could be eliminated by blowdown, scale formation would be checked.

The search for material which would perform this function was zealously conducted and soon it was found that phosphate would do just this thing. The use of phosphate, however, led to serious deposits in feed pumps and piping. Some twenty different forms of sodium phosphate presented the same difficulty.

Thomas Graham had reported to the Royal Society of London in 1833 on the discovery of sodium hexametaphosphate. Called Graham's Salt, this chemical was a scientific curiosity without practical application for nearly a century. It remained for Dr. Ralph E. Hall and his associates to demonstrate its unique properties among phosphates and make practical application in the field of water conditioning.[1, 2]

Metaphosphate has a distinct advantage over other phosphates in that it can be introduced with the feedwater without forming deposits in the feed lines. Once in the boiler, it reverts rapidly to orthophosphate and in so doing removes calcium phosphate sludge which does not form scale. Very small quantities are needed; usually a few parts per million in the boiler water will suffice. This method of control is very extensively used with excellent results in large and small plants alike.

**Engineer in a small industrial power plant, using standard testing kit, is shown determining the sulphate content of the water.**

* Part I of this article appeared in FOOD INDUSTRIES for May, 1941.

Organic materials such as the glucosides[3] and their derivatives are also administered as internal treatment. The theory advanced is that a gel forms which envelops the scale particles causing them to settle as non-adherent sludge rather than as hard scale. It has been demonstrated,[8] however, that scale is not first precipitated in the body of the boiler water, but actually crystallized out on the steel directly from solution. This being the case, gels can hardly function as supposed. Under difficult conditions an adjunct is used in connection with the gel. This adjunct is generally a phosphate so that the treatment resolves itself to a special case of phosphate conditioning.

### *External Treatment*

In process plants the percentage of make-up is likely to be large so that, except where a natural water of very low hardness is available, external water treatment is to be recommended both as a matter of economics and to reduce the amount of material to be eliminated from the water in the boiler. The choice of softener will depend on the analysis of the water to be handled.

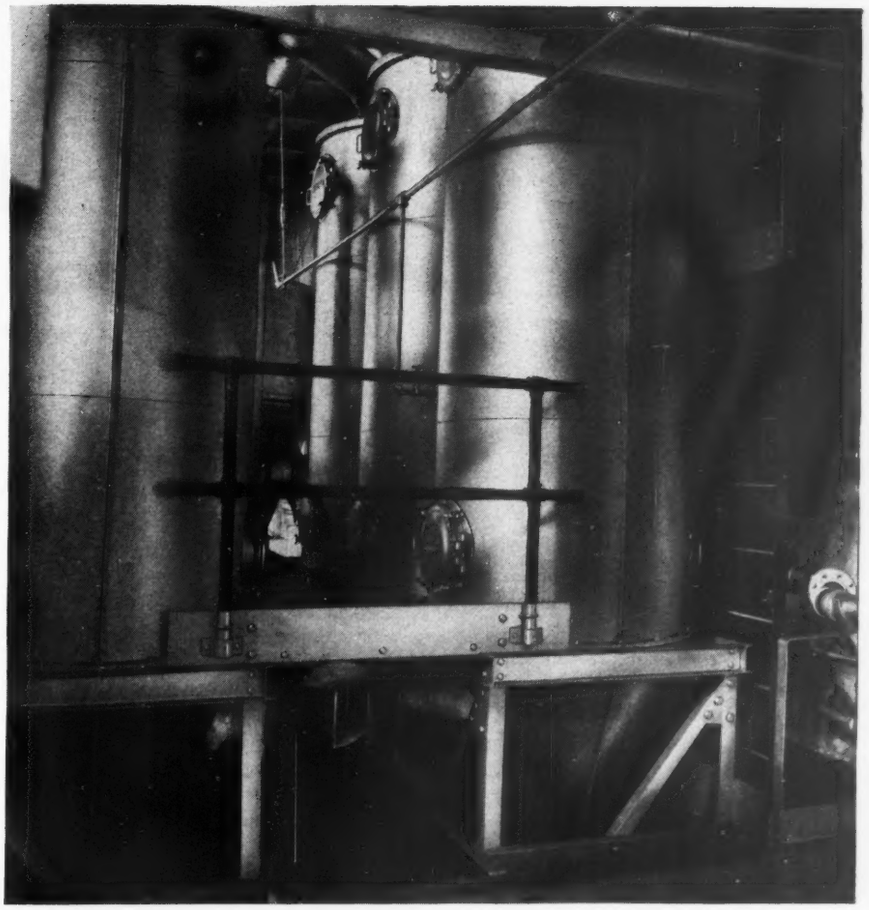
A good boiler feedwater should be free from suspended solids, excessive organics, oil or grease, and air and other gases. It should be of suitable sulphate-carbonate ratio to inhibit caustic embrittlement and should be low in dissolved solids, especially those of a scale forming nature. In plants where the steam comes in direct contact with the product, the water must also be free from chlorine and objectionalable tastes or odors.

Distillation of make-up, where the quantity is a large portion of the total feedwater, is to be discarded as too expensive both in first cost and operation, except in very unusual cases.

Zeolite and lime-soda softeners, either cold or hot process, are most generally employed in industry, although some very interesting new developments are entering the field.

Zeolite softeners have the peculiar property of retaining calcium and magnesium of the water passing through them, exchanging in their place the element sodium which has been stored in the mineral. Thus calcium bicarbonate becomes sodium bicarbonate. Magnesium bicarbonate also becomes sodium bicarbonate; calcium sulphate becomes sodium sulphate, and so on, until the water emerges with very low hardness. When the sodium supply of the zeolite mineral is exhausted, it can be replaced by regeneration (back-washing) with sodium chloride.

Zeolite softeners are compact and efficient, easy to control and relatively inexpensive to buy and operate. Nevertheless it must be remembered that they do not reduce the total solids but merely change their nature.



**Water treating installation in a large power plant, showing battery of filters used to remove precipitates from treated water.**

There is no question of the merits of the zeolite softeners in certain fields but, except in a few very special cases, they are not to be recommended for treatment of boiler feedwater. Where pretreatment of boiler feedwater is found to be economical or advisable, the primary objective should be the reduction of the total solids, as all of the material which enters the boiler must ultimately be removed by blow-down.

Lime-soda softeners require more space than zeolite softeners, more care in operation, and should be well designed and built. The chemical proportioning apparatus must function accurately and continuously without undue attention. Adequate time must be provided for in the reaction and settling compartments and an efficient filter must follow to remove the precipitates.

They will handle very hard waters efficiently and economically. Lime removes temporary hardness (calcium or magnesium bicarbonates) by forming insoluble compounds which are subsequently filtered out. Soda ash replaces calcium and magnesium in permanent hardness with sodium, forming sodium sulphate and sodium chloride which are highly soluble and remain in the water. In addition to lime and soda ash a coagulent such as alum is also added. After allowing time for the reactions to take place, the water is passed through a filter. Calcium sulphate may also be introduced with the lime to reduce sodium alkalinity and improve the sulphate-carbonate ratio. In this process, as distinguished from the zeolite, the total dissolved mineral matter is reduced in proportion to the temporary hardness which is precipitated.

Lime-soda softening may be accomplished either cold or hot; in batch or continuous process. The hot process is

(*Turn to page* 93)

#### References


1. R. E. Hall et al, Carnegie Institute of Technology, *Mining Met. Investigation Bulletin* No. 24, 1927.
2. E. P. Partridge and A. C. Purdy, *Industrial and Engineering Chemistry* **30**, 387–399, 1939.
3. Boilers and Furnace Number, *Power Plant Engineering* **42**, 2–70, 1938.
4. J. P. McDermet, *Transactions Am. Soc. Mech. Engrs.* **42**, 267–294, 1920.
5. A. R. Moberg, *Combustion* **3**, 36, 1931.
6. S. T. Powell, I. G. McChesney and F. Henry, *Industrial and Engineering Chemistry* **30**, 400, 1938.
7. P. G. Bird, *Proceedings Am. Soc. for Testing Materials*, 2–631, 1938.
8. R. E. Hall, *Industrial and Engineering Chemistry* 17, 283-290, 1925.

# Trucks Streamlined for Traffic

**Special panel body on short cab-over-engine chassis makes parking easy on busy city streets. Design has high advertising value**

EASY maneuverability, a short overall length making it easier to park at the curb on heavy-traffic streets and great advertising value are the three most important features of a new streamlined, insulated milk truck used by the St. Paul Milk Co. to serve office buildings and restaurants in the crowded downtown business districts of St. Paul, Minn.

Trucks of conventional type were either too small, or, if of a larger size, too unwieldy in the heavy-traffic areas. The problem was solved by the adoption of a cab-over-engine chassis with a specially designed panel body, all as shown in detail in the accompanying illustrations.

The truck itself is an International C.O.E. (cab-over-engine) model D-300 with a 99-in. wheelbase and a special insulated panel body built by the Shertzer-Niemand Body Co., Minneapolis, Minn., from drawings prepared by E. E. Wood, International Harvester Co. national fleet representative.

The body has a capacity of 120 cases of bottled milk and 40 cans of milk. In addition, butter is carried on a shelf extending for the entire width of the body at the front.

The inside dimensions of the body are 10 ft. 9 in. long, 6 ft. 1½ in. wide and 6 ft. 3 in. high. This gives a body five cases wide, except between the rear wheelhousings where three cases may be loaded.

For quick unloading on the route, the body has both side and rear doors. The one side door is on the right or curb side. The milk in cans is loaded and unloaded through the side door, the cans themselves being double-decked below the butter shelf at the front and held in place by chains.

The case milk may be unloaded through both the side and rear doors. The side door is 24 in. wide and the rear door opening 44½ in. wide, sufficient to load three cases wide.

Anyone looking out of the window of an office building in the downtown business sections of St. Paul, Minn., could not fail to recognize this special streamlined cab-over-engine route truck used by the Saint-Paul Milk Co. to serve such buildings and restaurants in the congested business areas. The side, front and rear name lettering is made of cast aluminum letters.

For ease in operation, double doors are fitted at the rear, joining at the center and hinged on the outer sides. When fully opened, these two-part doors do not extend beyond the outside body limits.

Thus neither door when open can be sideswiped by passing vehicles, as might occur with a full-width single door. Because the rear of the body is curved both vertically and horizontally, the doors themselves have a double curvature and must be hung expertly as shown in one of the accompanying illustrations.

Also to help the driver get into and out of the body more quickly, recessed steps are provided beneath both side and rear doors. These steps are surrounded by metal kick plates to prevent marring the body paint. An additional combination bumper-step is provided at the rear.

The total weight of the body is 3,000 lb. As shown, the body is skirted down to a point just below the center of the rear axle. It also has rear wheel covers and square-boxed interior rear wheelhousings. Case racks are provided over the wheelhousings, with room for three cases wide between the housings.

The body is insulated in sides and roof with 2-in. thicknesses of "Dry-Zero" insulation. This, with natural ice cracked and distributed around the bottles in the cases, together with a cake or two of ice carried alongside the cans in the front of the body, maintains the milk at a temperature of not over 48 deg. F.

**Three-quarters bird's-eye view showing the left side of the special body mounted on a model D-300 International cab-over-engine chassis. Note especially the roof contour and the pleasing curvature of the roof and belt mouldings.**

**How the driver works from either side or rear is shown in the above two views. Note the recessed steps and combination rear step and bumper to help expedite loading and unloading. Note also the double curvature on the two rear doors and how they are hung.**

The body has attained its unusual advertising value by the curvatures of its shape, by its color and by its lettering. The only straight lines on the entire body are the bottom skirt line, part of the belt moulding and three bands of decorative moulding at the front end just below the top.

The entire roof and rear end are curved in the three dimensions of length, width and height. The usual joint line between the roof and side panel and the roof and rear end is one continuous curved line of pleasing contour. The belt moulding line, curved at its rear end, is straight at the front to line up with the belt line on the driver's cab.

In keeping with the trend toward painting trucks handling food products a light instead of a dark color, the body is painted a cream with a tan tinge. Instead of being painted black to permit easy matching touchups when scratched or dented, the fenders are painted an orange color with a chocolate tinge. The same color is used on the cab skirt and on the rear wheel covers.

Instead of being painted, the Saint Paul Milk Co. name is made of cast aluminum letters in the company's trademark style of script. It is used four times on the body, front, rear and on both sides.

Thus the truck's identity is assured, no matter from what angle it is seen. Even the roof has the company name painted on it in large letters so that the truck can be further identified by persons looking out of office building windows in the areas served.

Tentative

# PROGRAM

# Second Annual Meeting
# Institute of Food Technologists

## WILLIAM PENN HOTEL, PITTSBURGH, PA.
## JUNE 15 TO 18, 1941

**Registration: Sunday afternoon, June 15; Monday all day, June 16.**

**First General Session**
**June 16, 9:45 a.m.–12:15 p.m.**

**Keynote speech,**

President S. C. Prescott, Dean of Science, Massachusetts Institute of Technology.

**Vitamin Restoration and Fortification**

Chairman: Walter H. Eddy, President, Walter H. Eddy Laboratories, New York, N. Y.

Vitamin Restoration as Viewed by Physicians, Russell M. Wilder, Mayo Clinic, Rochester, Minn.

Vitamin Content of the American Dietary, G. R. Cogwill, Professor Physiological Chemistry, Yale University, New Haven, Conn.

Vitamin and Mineral Fortification of White Bread, J. A. Tobey, Director of Nutrition, American Institute of Baking, New York, N. Y.

**Divisional Meeting A**
**June 16, 1:30–3:20 p.m.—Urban Room**
**General Papers**

Introductory remarks, Session Chairman, L. V. Bass, Assistant Director, Mellon Institute of Industrial Research, Pittsburgh, Pa.

Laboratory Apparatus for Controlled Experimental Drying of Foods. E. C. Ritchell, E. L. Piret, and C. A. Mann, University of Minnesota, St. Paul, Minn.

Maintenance of Cloud in Citrus Juices, H. J. Loeffler, U. S. Bureau of Agricultural Chemistry and Engineering, Los Angeles, Calif.

An Attempt to Judge the Tenderness of Vegetables and Meats by Means of the Tenderometer (Preliminary report), Clarence W. DuBois and F. A. Lee, New York State Agricultural Experiment Station, Geneva, N. Y.

Food Manufacture Under the Food, Drug and Cosmetic Act: Duties and Opportunities of the Technologist, A. I. Kegan, Attorney at Law, Chicago, Ill.

Dried Albumen. I. Solubility and Color Denaturation. George F. Stewart and Ralph W. Kline, Iowa Agricultural Experiment Station, Ames, Iowa.

**Divisional Meeting B**
**June 16, 1:45–3:30 p.m.—Silver Room**
**Packaging and Storage**

Chairman: T. M. Rector, Director of Research Laboratories, General Foods Corp., Hoboken, N. J.

Current Trends in Food Packaging, C. A. Southwick, Director of Packaging, General Foods Corp., New York, N. Y.

Optimum Conditions for Refrigerated Storage, A. E. Stevens, Chemical Engineer, General Foods Corp., New York, N. Y.

Prevention of Insect Infestation of Foods, W. C. O'Kane, Professor of Entomology, University of New Hampshire, Durham, N. H.

**Divisional Meeting C**
**June 16, 1:45–3:30 p.m.—Cardinal Room**
**Waste and Byproduct Utilization**

Introductory remarks, Session Chairman, H. E. Barnard, Director of Research, National Farm Chemurgic Council, Columbus, Ohio.

Milk Byproducts Utilization, F. C. Atwood, President, Atlantic Research Associates, Inc., Newtonville, Mass.

Food Products Wastes—Assets or Liabilities, F. W. Mohlman, Director of Laboratories, Sanitary District, Chicago, Ill.

**Second General Session**
**June 16, 3:30–5:00 p.m.—Urban Room**
**Annual Business Meeting**

**Third General Session**
**June 17, 9:15 a.m.–12:00 m.—Urban Room**
**Food and National Defense**

Introductory discussion, Session Chairman, Paul E. Howe, Colonel U.S.A., Medical Corps, Washington, D. C.

A Modern Ration for a Modern Army, R. A. Isker, Lieut. Colonel, U.S.A. Quartermaster Depot, Chicago, Ill.

Army Experiments on Food Containers, R. A. Isker, Lieut. Colonel, U.S.A. Quartermaster Depot, Chicago, Ill.

Possibilities of Dehydrating Foods as an Emergency Measure, S. C. Prescott, Dean of Science, Massachusetts Institute of Technology, Cambridge, Mass.

Food Processing as a Phase of the National Nutrition Program, M. K. Wilson, Chairman, National Advisory Committee on Nutrition, Washington, D. C.

**Divisional Meeting D**
**June 17, 2:00–5:00 p.m.—Urban Room**
**Bacteriology of Sanitation**

Introductory remarks, Session Chairman, E. J. Cameron, Director of Research Laboratories, National Canners Association, Washington, D. C.

Are Trends in Quality Standards Consistent With Modern Production Practices, M. E. Parker, Manager of Production, Beatrice Creamery Co., Chicago, Ill.

Control of Bacteria in Moist Products, L. B. Jensen, Chief Bacteriologist, Swift & Co. Research Laboratories, Chicago, Ill.

Control of Bacteria in Dry Food Products, P. S. Prickett, Bacteriological Laboratory, Mead Johnson & Co., Evansville, Ind.

Practical Bacteriology applied to Plant Sanitation, H. E. Goresline, U. S. Bureau of Agricultural Chemistry and Engineering, Washington, D. C.

Relation of Engineering Design to Sanitary Control, (Bacteriologist's Viewpoint) E. H. Parfitt, Evaporated Milk Ass'n, Chicago, Ill.

**Divisional Meeting E**
**June 17, 2:00–5:00 p.m.—Silver Room**
**Protection and Improvement of Flavor**

Introductory remarks, Session Chairman, Washington Platt, Borden Company Research Laboratory, Syracuse, N. Y.

Methods for Determining Consumer Preferences, C. L. Arnold, Director, Kroger Food Foundation, Cincinnati, Ohio.

A Connoisseur Looks at Food Flavor, Crosby Gaige, Consultant, New York, N. Y.

New Developments in Flavor, Bernard H. Smith, Virginia Dare Extract Co., Inc., Brooklyn, N. Y.

Flavor Transfer in Refrigerated Storage, E. C. Crocker, Arthur D. Little, Inc., Cambridge, Mass.

**Divisional Meeting F**
**June 17, 2:00–5:00 p.m.—Cardinal Room**
**Process Engineering in Food Manufacture**

Introductory remarks, Session Chairman, L. V. Burton, Editor of FOOD INDUSTRIES, New York, N. Y.

What is Food Engineering, Robert Dillman, Plant Manager, Libby, McNeill & Libby, Blue Island, Ill.

A Choice in Process Design—The Case for Batch Operations. R. I. Tenney, Technical Director, Wahl-Henius Institute, Chicago, Ill.

Application of Noncorrosive Metals to Deodorizing Vegetable Oils, Allen Porter Lee, Consulting Engineer, New York, N. Y.

Continuous Refining of Vetable Oils, E. M. James, Lever Bros. Co., Hammond, Ind.

Engineering Aspect of Chlorination of Cooling Canals, Charles M. Merrill, Chemical Engineer, National Canners Association, Research Laboratories, Washington, D. C.

**The Education of Food Technologists**
**June 17, Luncheon Session**
**S. C. Prescott, Chairman**

The University Viewpoint, W. E. Cruess, University of California, Berkeley, Calif.

What Industry Expects, L. V. Burton, Editor, FOOD INDUSTRIES, New York, N. Y.

**Banquet**
**June 17, 7:00 p.m.**

Speaker: Dr. Morris Fishbein, Editor, *Journal of American Medical Association*, Chicago, Ill.

**Industrial Visits**
**June 18**

# New Packages & Products

### *Frozen Coconut*

"SNOCO" FROZEN COCONUT, marketed for some time in bulk to bakers, confectioners and ice cream manufacturers, is now being introduced in 4-oz. attractive transparent-cellulose bags in frozen food stores throughout the country.

The product, processed by Irwin R. Tucker Co., Chicago, is said to retain its natural white appearance, tasty flavor and normal moisture content. Snoco consists of fresh coconut, cane sugar, water, glycerine and salt.

### *Packaged Wheat Germ*

B. A. ECKHART MILLING CO., Chicago, and Sands, Taylor and Wood Co., Boston, are marketing wheat germ processed from clean, washed, hard wheat, in 8-oz. transparent cellulose moistureproof bags for family use.

Both the Eckhart product and "King Arthur" wheat germ distributed by the Boston company contain vitamins B, E and G. The product in both cases has been processed by heat-treating to a temperature which inactivates fat-splitting and proteolytic enzymes. The wheat germs may be eaten uncooked directly from the package, or the amount of three tablespoonfuls daily may be added to breakfast cereals, salads, eaten with milk or cream, or mixed with flour to give an appetizing, nut-like, wheaty flavor to bread, biscuits, muffins or other baked goods.

### *Chicory Tablets for Coffee*

THE CHICORY cultivated in Saginaw Valley and roasted and packed at Port Huron, Mich., by Heinr. Franck Sons, Inc., has been prepared in convenient, self-measuring tablet form for consumer use in coffee making. A single tablet is sufficient for a pot of coffee containing five or six cups. The tablet is scored so that it may be broken in half for making two or three cups.

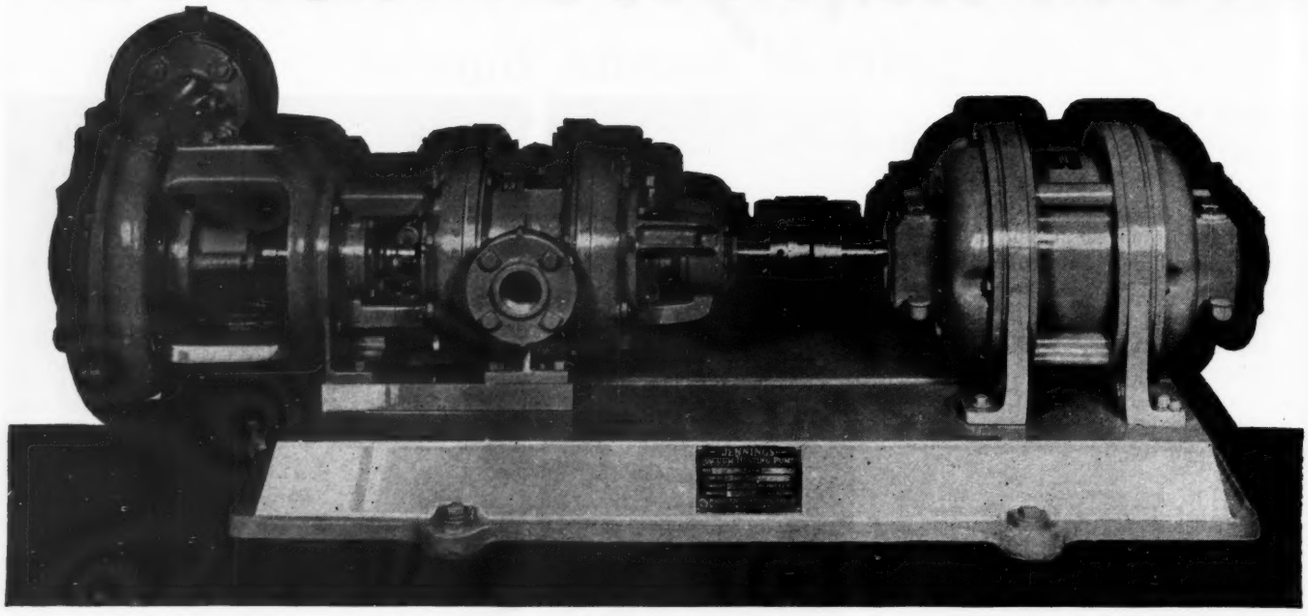
The roasted chicory root, which has been a part of the European diet for over a hundred years, contains 20 to 25 percent invert sugar (levulose). Powdered chicory, processed from this root, can be used in a wide variety of foods as an all-around seasoning ingredient.

### *Vitality Chocolate Bar*

TO CAPITALIZE on the attention now being focused on vitamin foods, Cook Chocolate Co., Chicago, is offering a new vitamin chocolate bar "Vita-Sert" (short for vitality dessert). This bar is similar to the emergency field ration which Cook supplied last year to the U. S. Army. The company, after a study of those vitamins most frequently lacking in the ordinary diet, has produced the candy bar from a bittersweet chocolate containing vitamins A, $B_1$, $B_2$, C and D.

While the vitamin chocolate bar is an outgrowth of the company's field ration bar, there is a great deal of difference in the composition and appearance of the two bars. The ration bar, which contains oat flour and milk as principal ingredients in addition to chocolate, sugar, vanilla flavoring and vitamin $B_1$, is wrapped in tinfoil and heavy white paper with the U. S. Army label, while the Vita-Sert bar for the consumer trade is marketed in foil and a transparent yellow wrapper with an informative label listing the vitamins contained.

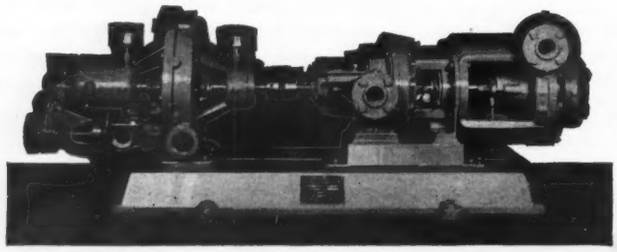
# Nash—the Perfected Vacuum Pump for Evaporators and Condensers



**COMBINATION VACUUM REMOVAL UNIT ESPECIALLY DESIGNED FOR SATISFACTORY OPERATION ON CONDENSERS WITHOUT BAROMETRIC LEG**

Especially designed for drawing air and liquid from high vacuums, the Nash Vacuum Removal Unit is an efficient combination of a standard Nash Vacuum Pump and a Jennings Centrifugal. This design may be had in either motor or steam turbine drive, and may be installed with confidence that it will operate perfectly.

Nash Vacuum Pumps for Evaporator and Condenser Service offer unusual advantages. Vacuum is non-pulsating, producing uniform operating conditions and assuring a better product. Nash Vacuum Pumps have no valves, gears, pistons, rings, or mechanical complications. The single moving element rotates without metallic contact, and no internal lubrication is required. In standard design these pumps maintain vacuums up to 27" of mercury.



**THE NASH VACUUM REMOVAL UNIT MAY BE HAD EQUIPPED WITH STEAM TURBINE DRIVE WHERE THIS TYPE IS PREFERRED**

Nash Pumps are compact, and require but a fraction of the space taken by old type equipment. They may be installed where convenient, and they operate at suitable speeds for direct connection to either electric motors or steam turbines. Nash engineers will be glad to recommend proper equipment to exactly meet your particular requirements.

## NASH ENGINEERING COMPANY

**SOUTH NORWALK · CONNECTICUT, U. S. A.**

The Food Industry News

GENERAL NEWS, BUSINESS TRENDS, MEN, JOBS AND COMPANIES • JUNE, 1941

# Shipments of Food to Britain Reach Important Proportions

**Size of SMA purchases reflect magnitude of aid. $90,000,000 worth of commodities sent or awaiting ships in mid-May**

SOME IDEA of the extent and direction of America's food aid to Britain can be obtained from the listing of purchases by Surplus Marketing Administration since it became the official procurement agency for foodstuffs under the lend-lease program. Purchases made by SMA are lumped together in public announcement as available for relief programs, Red Cross war refugee distribution, lend-lease or for release on the market if prices get too high.

### *How Purchases Are Divided*

But there is only a modest program of war refugee feeding, and SMA admits its purchases permit practically no building up of reserve supplies which could be used to "dump" on the market in a price maneuver. School lunch and relief in kind distribution continues about at its established pace—requiring several millions of dollars worth of commodities monthly. All the rest goes to Britain, as fast as ships can be found to ship it. Officials have disclosed that $90,000,000 worth of commodities had been shipped, or was awaiting transport, by mid-May.

### *SMA Purchases*

The list of commodities purchased from March 15, when lend-lease began, to May 10, follows:

Apples (fresh), 1,026,063 bu.; dry beans, 54,261,300 lb.; fresh carrots, 238 tons; fresh grapefruit, 6479 tons; grapefruit (for processing into 91,715 cases of 24 No. 2's of juice), 3744 tons; canned grapefruit juice, 643,200 cases; canned grapefruit segments, 398,418 cases; onions, 16,000 50-lb. sacks; white potatoes, 906,598 bu.; raisins, 15,000 tons; cheese, 15,290,500 lb.; canned process cheese, one million pounds.

Also, dry skim milk, 11,131,050 lb.; dry whole milk, 60,000 lb.; evaporated milk, 1,337,000 cases; wheat flour (enriched), 307,285 bbls.; lard, 103,818,655 lb.; pork products, 46,464,384 lb.; canned fish, 103,635 cases; canned pork meat products, 21,822,296 lb.; cured pork meat products, 38,440,000 lb.; corn starch, 13,440,000 lb.; biscuits, 220,000 lb.; canned oleomargarine, 212,500 lb.; canned pork and beans, 23,300 cases; cracked wheat, 4,800,000 lb.; rice, 3,200,000 lb.; canned tomatoes, 618,675 cases; eggs (shell), 664,455 cases; oranges, 271,886 boxes.

# Production of Dried Vegetables To Go Up

**Supplies for Britain, for Army and increased consumption by civilians are reasons**

A report prepared by the Bureau of Foreign and Domestic Commerce discloses that seven dehydrating concerns (90 percent of the field) produced 4,865,227 lb. of dehydrated vegetables in 1940. These same firms are planning to step up 1941 production 30 percent, mostly for rehydration for use as vegetables (as distinguished from powder for seasoning). Existing plant capacity of eight firms, operating 17 plants, on a 24-hour-day schedule, are shown to have a production potential of 66,000,000 lb. in a normal season.

"Maybe we did put too many vitamins into it!"

Federal specifications are being prepared for seven vegetable commodities in the field to pave the way for possible government purchases for the armed forces. Commodities expected to be given specifications are shredded cabbage, flaked onions, julienne, diced and flaked carrots, shredded spinach, shredded and cubed potatoes, flaked tomatoes and sweet potatoes.

Potential government use of dehydrated vegetables lies more in the aid-to-Britain field than in serving the military forces at this stage.

Army officials plan, once specifications are set up, to make small experimental purchases of dehydrated vegetables. Primarily, however, these commodities are considered now to be of value mostly as emergency provisioning of bases outside continental United States.

Dehydrated producers, according to the Birgfeld report, are planning a concentrated campaign to increase civilian consumer use of their products during 1941. Several manufacturers are planning to put their foods on the retail market for the first time, and others expect to step up selling campaigns.

# Nut Packers Scheduled For Seasonal Exemption

SEASONAL EXEMPTION for the packing, storing and drying of unshelled walnuts and filberts has been announced in a determination by General Philip B. Fleming, administrator of the Wage and Hour Division of the Fair Labor Standards Act. The determination, made on application of the California Walnut Growers Association, the North Pacific Nut Growers Cooperative and others, provides that employees engaged in the packing, storing and drying of unshelled walnuts and filberts can be worked for 12 hours a day, or 56 hours a week for 14 weeks, without payment of overtime rates. This does not apply to the shelling of walnuts and filberts or to the packing or storing of walnut and filbert kernels.

# Millers Plan Future At Chicago Meeting

**See enrichment program as milepost of progress. Industry to get free advertising**

INCREASED recognition for young executives, improved products, planned merchandising and forward-looking management summarize the "looking ahead" program for members of the Millers' National Federation as emphasized during its 39th annual convention held May 14 to 16 at Chicago.

An indication of management trends in the milling industry was evidenced by those attending the meeting; 23 percent of all millers present were sons, grandsons and great-grandsons of former millers. The program for one-half day session was given over to those young executives, some of whom are now presidents and vice-presidents of their companies.

Vitamin and mineral enrichment program for flour was cited by President Ward Magill as "one of the finest examples of cooperation between science, industry, and government which can be found." He regards 1941 as a milepost of progress for the milling industry in the improvement of the nutritional qualities of white flour, and he believes that the future for the milling industry should be of the best.

In discussing enrichment of white flour, Ralph Missman, Sunnyside Milling Co., Evansville, Ind., a 480-bbl. mill, declared that "the smallest miller can enrich his flour just as easily and as accurately as the largest miller by using concentrates."

Paul Cornell, coordinator for the enrichment program, announced that the government nutrition spokesmen are in agreement with the millers and bakers that incorporation of riboflavin in enriched flour and bread might well be postponed until May 1, 1942.

Announcement was also made that each of the ten Macfadden publications will carry one page per month of institutional advertising on enriched flour and bread without charge. Recommendations were made for the calling of state nutritional conferences by state governors and that a one-half hour NBC broadcast for 13 weeks be underwritten on merely the cost of the talent used; air time to be given without charge.

## Food Standards Progress

HEARINGS on two dockets adjourned during May. These were on cheeses and chocolate products, detailed stories of which appear in this issue. Briefs are due by June 30 and July 1 respectively.

**DEFENSE POSTER**

**This poster, strikingly done in red, white and blue colors, is being distributed primarily to all firms engaged in defense work. Issued by OPM, additional copies and blue colors, is being distributed sion of Information, Office for Emergency Management, Washington, D. C.**

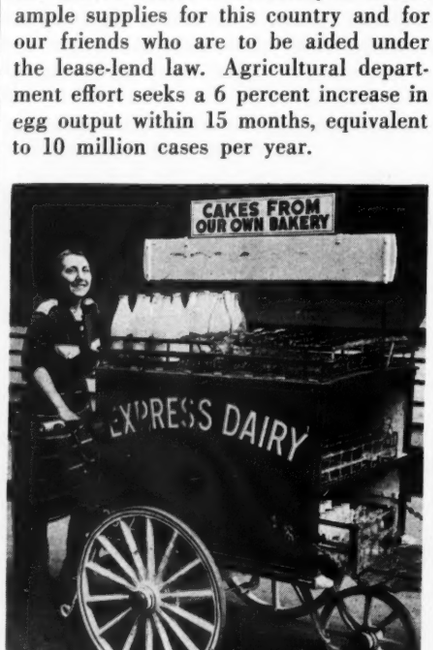
Tentative orders are expected on dietary foods, canned fruits, fruit cocktail, and habit-forming drugs. Final orders are awaited on flours and oleomargarine. No new dockets had been announced up to May 19.

## America Eats Well

COMMERCE DEPARTMENT estimates are that American consumers spent $14.8 billion for food produced by United States farmers in 1940.

## Wants Egg Output Increased

A DRIVE to increase egg production in the United States is necessary to assure ample supplies for this country and for our friends who are to be aided under the lease-lend law. Agricultural department effort seeks a 6 percent increase in egg output within 15 months, equivalent to 10 million cases per year.




*Harris & Ewing*

**WOMAN'S PLACE IN WAR**

**The men being needed for more dangerous assignments, women in Britain have taken over many of their non-military jobs. Here, for instance, is a lady milkman making the rounds in the Bank area of London.**

# OPM Asks Reduction In Coating on Cans

**But containers for several foods will continue to be made with same thickness of tin**

CAN MANUFACTURERS were asked by OPM on May 5 to make a 10 percent reduction in the tin coating of most cans to speed the accumulation of tin reserves "necessary for the national defense."

The can manufacturers can continue to use the present amount of tin coating on containers for certain packs, such as grapefruit, plums, sauerkraut and many other products. But they were asked to adopt the following conservation measures with regard to containers for other packs:

1. For most types of tin cans use tin plate with a coating weighing 1.35 lb. per base box instead of 1.5 lb. as at present.
2. Substitute terne plate for tin coated containers wherever feasible.
3. Use black plate instead of terne plate wherever terne or tin coatings are not required.

The following is a list of foods for which *no reduction* in tin coating is allowable.

**Fruits:** Apple products, except apple sauce; apricots; berries, except blueberries in plain cans; cherries; cranberry products; currants; spiced, pickled and strained fruits; grapefruit; grapes; ripe olives; papayas; spiced peaches; spiced pears; plums; prunes, dry or in sirup; quinces, rhubarb. (The reduction for peach and pear cans is permissible only where L steel base plate is used.)

**Vegetables:** Green beans, all styles in inside enameled cans; dry beans, Mexican style; beets; carrots, all styles in inside enameled cans; pickles; sauerkraut; strained and chopped vegetables.

**Specialties:** Chow-chow; fruit butters; jams and jellies; marmalades; milk, sweetened condensed; mince meat; plum puddings; spiced puddings.

**Meats and Meat Products:** Chili-con-carne; frankfurts and sauerkraut.

**Juices:** All food juices except clam, pineapple and tomato.

Reduction is permissible with fish and shellfish, ready-made entrees and soups.

## New Hampshire Adopts Federal Food Standards

THE New Hampshire Food and Drug Law has been amended to provide that the state board of health may adopt such definitions and standards of identity as may be promulgated from time to time under the Federal Food, Drug and Cosmetic Act. The state board, charged with enforcement of the food

and drug law, may, under the new amendment, make rules and regulations in line with Federal legislation on standards of identity under the Food, Drug and Cosmetic Act and the Meat Inspection Act.

## AAA Acts to Increase Canning Crop Acreages

CHANGES in the Agricultural Conservation program are being made by the Department of Agriculture to allow increased production of tomatoes, corn, peas and snap beans for processing. Revised AAA provisions will permit farmers to expand acreage without deductions from their farm program payments. A 50 percent increase in tomatoes for canning is desired.

## Answers to Food Law Questions

***Interpretative Opinions from F&DA Letters to the Industry***

ONLY THREE ITEMS of importance to food manufacturers have appeared in the Food and Drug Administration trade correspondence since the last printing in FOOD INDUSTRIES, February issue, page 67. The first of these appeared as a trade notice and was summarized in the March issue on page 81. To keep this series of "answers" complete, however, it is repeated below.

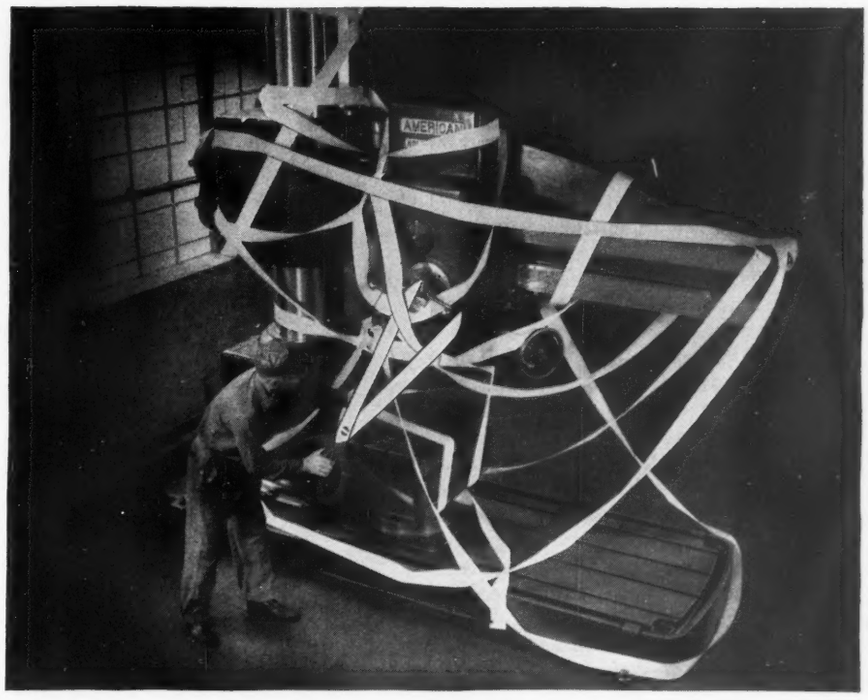
### ABSTRACTS

224. Pending the effective application of definitions and standards of identity, or an announcement that standards will not be issued, the Food and Drug Administration will not prosecute a number of foods on the ground that they do not declare ingredients on the label. The foods so exempted are the list originally announced in February, 1939 (FOOD INDUSTRIES, March, 1939, page 164), plus ice cream and carbonated beverages. For convenience this list is summarized below:

White bread; whole wheat bread; milk bread; raisin bread; evaporated milk; sweetened condensed milk; malted milk; unmixed, immature canned vegetables; unmixed canned fruits; canned oysters; canned clams; canned shrimp; canned fish roe; sauerkraut; olives in brine; cheeses; oleomargarine; mayonnaise dressing; fruit preserves; sweet chocolate; sweet milk chocolate; lemon extract; orange extract; vanilla extract; ice cream; frozen custard; ice milk; milk sherbet; water ice or ice sherbet; and nonalcoholic carbonated beverages.

225. Mixtures of strawberries, apple juice and sugar must be labeled as *imitation strawberry jam* and bear list of ingredients in order of predominance by weight.

226. The term "Pure Food Color" is inappropriate when applied to mixture of certified coal-tar color and diluents, since it is ambiguous and may mislead; the designation "Certified Food Color" is recommended as more informative.

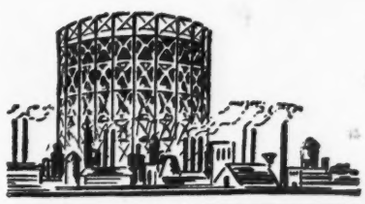



**THIS IS GOING TO HELP!**

"Washington" is streamlining its supervision of defense. Slashing right and left at the traditional red tape.

Food plants that will keep abreast of production demands are equipping for speed plus *control* in every operation. In roasting, toasting, baking, high temperature cooking and can-making operations, Kemp equipment contributes not merely speed but *uniformity* that protects against spoilage.

Fuel saving with Kemp equipment (which runs from 15 to 40 percent) takes a back seat today for *control* that cuts rejects as well as stepping up the pace. For assistance with your process heating problem address **The C. M. Kemp Mfg. Company 405 E. Oliver St. Baltimore, Md.**



**KEMP of BALTIMORE**

## Trade Deals Planned For Close Tie with S.A.

### Negotiations with Argentine and Uruguay affect food tariffs

THE Department of State has reopened its trade agreement activities with negotiations for new trade agreements with Argentina and Uruguay. Mid-May announcement was made of the tariff provisions in the present American law which are to be subject to review. It was also stated that certain of the fats and oils which are subject to special excise taxes are also to be so considered, notably tallow, sunflower oil, oleo oil and oleo stearin.

Among the other products on which the United States will consider granting tariff concessions to Argentina are: Extract of meat; prepared and preserved meats; prepared and preserved fish; pickled and salted fish; macaroni and related products; fresh fruits; all jellies, jams, marmalades, and fruit butters; tomatoes prepared or preserved in any manner; corned beef hash; cordials and liquors; still wines; and many other commodities not of such direct interest to the manufacturers of food.

The comparable list for discussion with Uruguay includes casein and related products; extract of meat; prepared and preserved meat; sausage casings; and numerous other non-food products.

It should be understood that when any such tariff concession is made, it is applicable not only to the commodities coming from the countries with which the agreement is reached, but also to all imports of like nature, regardless of the country of origin.

## Puts Dry Ice Into Coffee

JOHN HANSEN & SONS, Oakland, Calif., coffee roasters, pack a small tablet of dry ice into each can at the time it is sealed and the air drawn out. It is claimed that the process removes all air from the can, that the dry ice, technically $CO_2$, sets up its own pressure and in connection with the gases of the coffee supplies a natural coffee gas that retains flavor indefinitely. The can used has a dome top, which gives it a distinctive appearance.

## Seek Blitz Candy Bar

SEVERAL of the large confectionery manufacturers, at the suggestion of Army officers, are experimenting with a compact ration of sweets to contain the essential vitamins, proteins and carbohydrates in sufficient quantity to serve as full daily ration for the soldier on the march. The discovery of such a ration would greatly lessen the food transportation and storage problem of the forces on the move.

**NEW AACC PRESIDENT**
**Dr. Charles N. Frey, director of Fleischmann Laboratories, New York, has moved up from vice-president to president of American Association of Cereal Chemists.**

## Food Defense Agency Revamped by Government

THE Agriculture Division of the old National Defense Advisory Commission now has been replaced by an Office of Agricultural Defense Relations reporting directly to Secretary Wickard. This is the first of the old NDAC units which was not transferred to the Office for Emergency Management.

John B. Huston, former AAA official who was Chester Davis' assistant in the NDAC division, is head of the new OADR. Mr. Hutson's office is available to food processors who find themselves squeezed by the defense program by priorities on labor or equipment.

**HEADS BREWING CHEMISTS**
**Leo Wallerstein, of Wallerstein Laboratories, New York, has been re-elected president of American Society of Brewing Chemists.**

## Final Standards For Flour Issued

### Effective Jan. 1, riboflavin is required as an ingredient in enriched flour

On the opening day of the National Nutrition Conference in Washington, the Food and Drug Administration on May 26 issued definitions and standards of identity for wheat flour and related products. And despite protests from the industry, the Federal requirements for enriched flour call for riboflavin as an ingredient—not less than 1.2 milligrams per pound. These final standards, however, do not become effective until Jan. 1, 1942.

That part of the standards containing the enrichment specifications reads: "Pending experience with the use of enriched flour and enriched self-rising flour, consumer education and understanding will be facilitated by restricting the enrichment, not only with respect to the ingredients to be contained therein, but also by fixing the minimum and maximum amounts of such ingredients. Reasonable limits for this purpose are, for each pound of flour or self-rising flour: Not less than 1.66 mg. nor more than 2.5 mg. of vitamin $B_1$, not less than 1.2 mg. nor more than 1.8 mg. of riboflavin, not less than 6 mg. nor more than 24 mg. of nicotinic acid or nicotinic acid amide, not less than 6 mg. nor more than 24 mg. of iron, not less than 250 U.S.P. units nor more than 1,000 U.S.P. units of vitamin D, and not less than 500 mg. nor more than 2,000 mg. of calcium."

The complete standards were published in the *Federal Register* of May 27.

## Dairy Research Begun

A RESEARCH PROGRAM to discover new food values in dairy products is now under way in the laboratories of the National Dairy Council. The program, termed by Milton Hult, president of National Dairy Council, as the "most important research project for the dairy industry since that which led to the discovery of the famed fat-soluble vitamin A in milk," is already under way.

## Makes Plastics from Coffee

SURPLUS COFFEE now burned in Brazil at an annual loss of $1,400,000 is to be made into a plastics material. Already a pilot plant is partially completed which will produce 18,000 lb. of plastics daily from 215 bags of coffee. And soon work will start on a $5,000,000 plant to make 500,000,000 lb. of plastics annually, which would make Brazil the world's principal producer of plastics powder.

## Charges Lecithin Monopoly

BREAK-UP of the lecithin organization which centers in American Lecithin Co. was virtually ordered by Federal Trade Commission during the first week of May. The government charges that the firms and company officials involved illegally conspired in their marketing practices and that they "attempted to further monopolize trade in lecithin by disparaging competitors' products, by using patents in bad faith to induce purchasers to buy the respondents' lecithin, and by other means."

## FDA Disputes Gelatin Claims

ENERGY is not produced and fatigue is not relieved by consumption of Knox Gelatin. This is the claim of the Food and Drug Administration in a Camden, N. J., seizure of approximately one hundred cases on the ground that label claims are false and misleading. At the time of writing (May 19) the manufacturer had not filed an answer to the Food and Drug Administration charge.

## Army Buys Argentine Beef

THE ARGENTINE BEEF controversy was in the spotlight again last month as the Army agreed to buy up to 20,000,000 lb. of Argentine tinned meat. Still struggling with the problems of a foreign beef surplus at a price of $0.19 a lb. compared with a domestic price of $0.33 a lb., Washington officials are awaiting the National Conference on Nutrition, when they will discuss the possibility of adding some Latin American surpluses to the products distributed now through the food stamp plan.

### SCHEDULE OF EVENTS

**JUNE**

2– 3—Certified Milk Producers Association of America, Hollenden Hotel, Cleveland.
2– 5—National Confectioners' Association of the United States, Palmer House, Chicago.
2– 6—Association of Operative Millers, Hotel Jefferson, St. Louis.
15–18—Institute of Food Technologists, second annual convention, William Penn Hotel, Pittsburgh.
15–18—Flavoring Extract Manufacturers' Association, Hotel Traymore, Atlantic City, N. J.
23–24—National Macaroni Manufacturers' Association, William Penn Hotel, Pittsburgh.
25—National Pickle Packers' Association, Palmer House, Chicago.
26–28—National Dairy Council, annual summer conference, Edgewater Beach Hotel, Chicago.
30–July 18—Summer course in Food Technology, Massachusetts Institute of Technology, Cambridge, Mass.

**JULY**

8–10—National Confectionery Salesmen's Association of America, Atlanta, Ga.
10–12—Convention of the Southern Wholesale Confectioners Association, Biltmore Hotel, Atlanta, Ga.
16–18—National Cherry Festival, Traverse City, Wash.
17—Tri-State Packers' Association midsummer meeting, Talbot Country Club, Easton, Md.

# Making the Dollar Sign SMILE . . .

## *on the SALES sheet and COST sheet*

Just a few of the many food products wrapped on our machines.

It's no mere coincidence that so many "star sellers" are wrapped on our machines. . . . The answer is to be found in the wide scope these machines offer in *package improvement*—the many types of packages which they can produce, the unlimited choice they afford in selection of packaging material, and the perfect manner in which they adapt the package to the requirements of the product.

But that's not all. Manufacturers have found that our machines are "penny-pinchers" as well as "sales-boosters"—an important thing these days. They make a perfect wrap with the minimum of material, and in most cases use this material in roll form, saving up to 20%. Require little supervision, saving labor cost. The high speed at which they operate and the small amount of floor space occupied result in top production per square foot.

In going after package improvements, it pays to keep your eye on the *cost sheet* as well as the *sales sheet.*

***CONSULT OUR PACKAGING CLINIC***

PACKAGE MACHINERY COMPANY, Springfield, Mass.
NEW YORK CHICAGO CLEVELAND LOS ANGELES TORONTO
Mexico, D. F.: Agencia Comercial Anahuac, Apartado 2303
Buenos Aires, Argentina: David H. Orton, Maipu 231
Peterborough, England: Baker Perkins, Ltd.
Melbourne, Australia: Baker Perkins, Pty., Ltd.

**PACKAGE MACHINERY COMPANY**
Over a Quarter Billion Packages per day are wrapped on our Machines

STOP THOSE WORMS!

EVERY food manufacturer who uses or stores nuts knows that worms can get in unless something is done to stop them. Once started, they cause destruction and wasteful contamination.

Worms and other pests can be controlled by thorough fumigation with an effective fumigant such as HCN gas, properly applied. Plant fumigation should be part of a well planned campaign —to be carried out only by trained, experienced men.

Many food processors have found that control problems are ably handled by established Pest Control Operators operating in their locality. These operators are equipped to give prompt and specialized service on practically any type of mill fumigation.

If you have your own fumigation crew, we have a useful book about pests and their control by fumigation. Just drop us a line on your letterhead and we will be glad to send you a copy. No obligation, of course.

DU PONT

E. I. DU PONT DE NEMOURS & CO.
INCORPORATED
THE R. & H. CHEMICALS DEPARTMENT
WILMINGTON • DELAWARE

CYANEGG
AN ECONOMICAL SOURCE OF HCN FUMIGATING GAS


# Justice Department Indicts 6 Dairies

**New York companies charged with fixing price of milk sold in stores. Charge is denied**

CHARGED with violation of the Sherman Antitrust Act, six New York dairies and 33 of their officers and directors have been indicted by a Federal Grand Judy for fixing arbritrary prices for milk sold in stores.

The dairies are alleged to have put the price of milk in stores at 2 cents more a quart than the price charged by independent distributors, although there was no substantial difference in quality. The companies were also accused of attempted control of other companies by threats of "cutting prices, giving free rebates, free merchandise and other concessions and allowances."

Officials of the dairies have expressed confidence of vindication of the charges, and pointed out that the indictment concerned the sale of milk in stores, an unprofitable part of their business.

This investigation of milk prices is part of a nation-wide drive by the Department of Justice to eliminate "unnecessary and costly" methods in food distribution.

# FDA and Industry Argue Over Name for Cheese

**It's "cream cheese" to industry but "neufchatel" to FDA**

THE BATTLE of the cheeses raged in the latter days of April and the first of May. Actually, it was a continuation of the cream cheese docket begun 21 months ago (October, 1939). It was broadened by including the closely related cottage, farmer's and neufchatel cheeses.

The major point of contention at the hearing was the use of the term "cream cheese" to describe two products of different identity. The high-fat, or "No. 1," cream cheese is the product of the cheese manufacturer when starting with cream. When whole milk is used as the starting material instead of cream, a product resembling cream cheese is achieved. For many years this also has been called "cream cheese," "low-fat cream cheese" or "No. 2 cream cheese," depending on who is describing it. The Food and Drug administration takes the stand, however, that this should be called "neufchatel cheese."

The true neufchatel cheese is made by a cold-pack process. The low-fat cream cheese now on the market is made by a hot-pack process, but its composition is almost identical with that of true neufchatel. The claim is that they are as similar as are two high-fat cream cheeses, one made by the cold-pack and the other by the hot-pack process.

Cheese manufacturers argue that changing the name of low-fat cream cheese to "neufchatel" would result in loss of a great amount of business.

Cream cheese manufacturers using the hot-pack process, which requires the addition of gum to prevent moisture loss, claim that the proposed butterfat minimum of 35 percent for cream cheese is too high to reach with technical success. However, off-the-record comments at the hearing implied that economic factors were more important than the technologic.

Briefs on this docket are due by June 30. The names chosen for the various cheeses will probably not be officially known for some weeks after that date.

# Mold Tolerance Raised For Tomato Juice by FDA

FOLLOWING an exhaustive appraisal of the problem of maintaining a low mold count in tomato products, the Food and Drug Administration has somewhat eased its restrictions on tomato juice. As a result, the FDA will not institute actions against tomato juice on the ground of excessive mold count unless mold filaments are present in more than 20 percent of the microscopic fields (this had been set at 15 percent in 1940). And adequate allowances will be made in applying the tomato juice tolerances to those articles which have been subjected to a homogenization process.

No change is made, however, in the tolerance for tomato catsup, puree and paste. FDA concludes that "it is not unreasonable to expect canners to meet the mold tolerance of 40 percent of the microscopic fields announced in 1940."

# U. S. Holds Food Probe In Southern California

RETAIL AND WHOLESALE grocers and allied firms of Southern California are facing investigation by the antitrust division of the Department of Justice for alleged price-fixing of food in that area. Special Attorney A. Andrew Hauk, cooperating with local authorities, has issued to 20 food companies subpoenas to appear before a Federal Grand Jury, to ascertain "why food prices in Southern California are 6 to 7 percent higher than those of Texas markets."

The Department of Justice food probe, launched to make a complete survey of the food industry in this territory, seeks evidence of possible price-fixing done under authority of the California Unfair Practices Act.

## Chocolate Products Hearing Finally Ends

### As latest shot in sugar battle, F&DA approves turbinados

In a brief two and one-half day session, the latest shots were fired in the sugar war, these coming in the battle of chocolate products. The problem was to determine the status of turbinados as permissible optional sweetening ingredients.

The Food and Drug Administration presented the results of a factual survey in which it was shown that, as a class, turbinados were wholesome sweetening agents. The principal characteristics differentiating them from refined sucrose were found to be color, turbidity and flavor. A "flavor factor" was demonstrated by technical representatives of F&DA. The government proposed that turbinados be described on a chocolate label as "partially refined sugar."

Although this closing session of the hearing was devoted entirely to sucrose, the manufacturers of sweetening agents derived from corn took this occasion to express their long-range philosophy. In a letter to the presiding officer, they stated their belief that manufacturers of one ingredient should not endeavor to exclude another ingredient from recognition in a standard of identity. This statement was "a refreshing breath" in the saccharine atmosphere.

Briefs in this docket must be filed by July. 1. It will probably be sometime in the fall before a tentative order is issued.

## Canners Face Investigation

Federal inspectors of the wage and hour division are covering 700 canning and packing plants in Georgia and Florida in a two-month investigation of working conditions in the fruit and vegetable industries. The wage and hour probe will be carried on in Georgia peach packing and vegetable canning factories and in the plants of Florida citrus fruit, deciduous fruit and fresh vegetable concerns.

## Stamp Plan Aids 4,000,000 Families

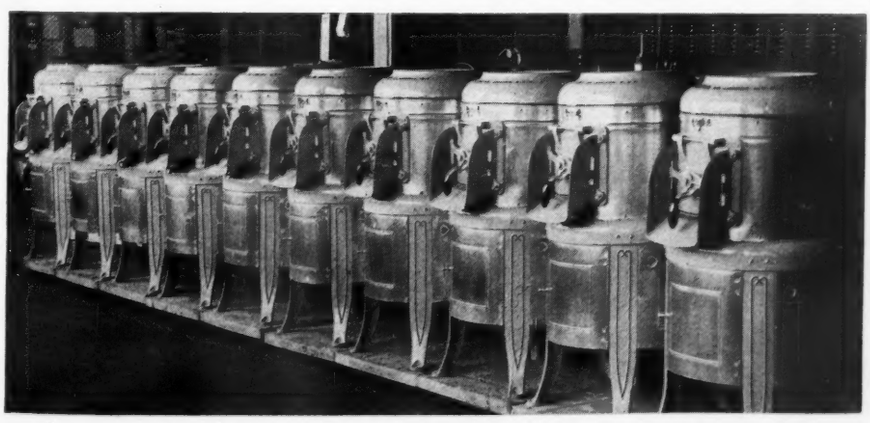
### Surplus commodity needs give way to emphasis on nutrition of nation's low-income group

The surplus food stamp plan passed its second annual milestone in mid-May. The program now is in effect in 50 percent of that area of the nation in which more than half the nation's population resides. More than 4,000,000 families are listed as participants and the monthly value of farm products distributed for stamps has passed the $9,000,000 level.

The second anniversary was marked with indications that the program may be changing from a surplus-commodity distribution scheme to a means of promoting national nutrition. Behind this gradual swing in emphasis lies what may develop into a first class political pressure campaign.

With the Department of Agriculture officially offering "bonuses" and pegged prices to farmers to induce them to step up production of many of the commodities now included in the surplus stamp list, it is becoming increasingly difficult to justify their continuance. Among such products are butter, eggs, pork and lard. Recently, the problem has been particularly acute as regards butter, because of the contra-seasonal price rise.

Many Agriculture officials believe butter may have to be dropped from the stamp list to halt the price advance.



**PANZER POTATO-PEELING DIVISION**

**Soldiers in Uncle Sam's 1941 model Army have more important things to do than peel spuds. So mechanical potato peelers are doing that bit of dirty work. Above is shown a Panzer peeling division which will blitz through 600 lb. of spuds a minute, or a bushel a minute per machine. The peelers are lined up in the Chicago plant of Reynolds Electric Co. for inspection before delivery to various Army camps.**

**PRIZE WINNING QUALITY**

*Always!*

A golden stream of uniformly perfect chips—crisp, dry, tender and salted to the Queen's taste—hour after hour, day after day. That's the regular performance of a

**FERRY CONTINUOUS POTATO-CHIP MACHINE**

Starting from raw unpeeled potatoes every operation except inspection of the peeled potatoes is completely automatic and continuous . . . peeling, slicing, drying, frying, cooling and salting are all under "push button control"—And better yet, production costs are far lower than with other manufacturing methods . . . Made in 5 sizes with capacities from 50 to 350 lbs. of chips per hour . . . If you are in the potato chip business to make money it will pay you to get complete details of Ferry Machines today . . . Write for Bulletin.

*ALSO MAKERS OF:*
SLICERS & AUTOMATIC SLICER FEEDERS
CAN WASHING MACHINERY

**J. D. FERRY CO.**
129 SO. CAMERON ST.
HARRISBURG, PA.

..prolongs Equipment Life

YOU want to keep your metal processing equipment clean, sanitary, new-looking. But remember, there is a WRONG way and a RIGHT way to clean aluminum, Monel metal, stainless steel, tinned, galvanized or glasslined equipment. The wrong way can easily prove costly, time-consuming . . . and may harm equipment!

In cleaning aluminum, tinned or galvanized surfaces, for instance, raw alkalies cause etching, darkening, discoloration or spangling. But why take chances? Particularly when, by using SAFE, specially-designed Oakite materials, you not only CLEAN THOROUGHLY and quickly, but also PROTECT surfaces of equipment and thus extend its life.

One large packing plant, for example, finds an Oakite material is the money-saving answer to their problem of cleaning aluminum kettles. It thoroughly, speedily yet SAFELY removes deposits. For cleaning tinned ham molds, a Mid-western meat packer uses an Oakite material because (1) it has no harmful effect on tinned surfaces, and (2) the extremely small amounts of material used keep cleaning costs really low!

**What Is Your Problem?**

Tell us . . . let us prove to your complete satisfaction the safety, speed, thoroughness and economy of tested Oakite cleaning. Since there is no obligation, won't you write today?

OAKITE *Tested* CLEANING FOR QUALITY CONTROL

Complete Nation-Wide Service For These Industries

•

MEAT PACKING
CANNING
SAUCES & SOUPS
DAIRY
FROZEN FOODS
BAKING
SPICES & CONDIMENTS
CEREAL PRODUCTS
POULTRY PACKING

Manufactured only by

OAKITE PRODUCTS, INC., 26G THAMES ST., NEW YORK, N. Y.

Representatives in All Principal Cities of the United States and Canada

## Army's Kick on Price Of Tomatoes Ironed Out

### Dispute between OPM officials and industry ends

THE ARMY'S "dissatisfaction" with prices quoted for canned tomatoes has been ironed out, at least temporarily. Negotiated purchases to make up the portion of the 300,000-odd case requirement for which bids were not accepted have been worked out.

Consummation of these deals apparently closes, for the present, the dispute between the Subsistence Section and OPM's Procurement Division with the packers which flared publicly last month in a sharp statement from Donald Nelson. Nelson declared that many bid prices submitted were "very considerably higher than they should be" and made a point of the contention that only a "few" bids were received despite advance conferences with the packers and efforts to adapt the purchase to canners' practices.

## New AMS Standards for Mushrooms, Peas, Catsup

THE Agricultural Marketing Service has issued new standards for grades of canned mushrooms, canned peas and tomato catsup. These were effective May 15, May 1, and April 15, respectively. Abstracts of the standards will appear in a future issue of FOOD INDUSTRIES. Complete copies of the standards may be obtained from Agricultural Marketing Service, Washington, D. C.

## Packers Put on Carpet By Justice Department

CHICAGO meat packing firms are getting their share of attention by Federal authorities in the nation-wide campaign of the antitrust division of the Department

## Construction News

| | Pending (thousands) | Awarded May (thousands) | Total Awarded 1941 (thousands) |
|---|---|---|---|
| Bakery | $190 | $50 | $3,282 |
| Beverages | 240 | 407 | 4,324 |
| Canning and Preserving | 395 | 120 | 345 |
| Cold Storage Plants | ..... | 103 | 485 |
| Confectionery | 40 | 45 | 45 |
| Grain Mill Products | 640 | 295 | 2,772 |
| Ice Manufactured | ..... | ..... | 180 |
| Meats and Meat Products | 330 | 86 | 714 |
| Milk Products | 305 | 296 | 1,131 |
| Miscellaneous | 435 | 552 | 2,651 |
| | $2,575 | $1,954 | $15,929 |

of Justice to investigate price fixing and restraint of trade in the food industry. More than 100 witnesses, including officials of livestock markets and the major packing companies, were called before a Grand Jury to present their records dating back to 1936, in a probe of dressed meat prices and the market practices of packers, order buyers and commission men.

The meat price fixing inquiry, conducted by Daniel B. Britt, special assistant in charge of the Chicago antitrust office, is undertaken to assure the farmer or livestock raiser of a fair share of the consumers' dollar.

# CAPITAL VIEWS

**MORE FARM LOANS**—The political pressure to give farmers more money continues almost unabated in this Emergency-Defense period. The attitude at the Capitol appears to be that everybody else is getting a nice big piece of pie, with plenty of juicy plums in it. If so, why not the farmer? The result is going to be serious for the food budgets. And it is going to make it that much harder for millers and bakers to deliver flour and bread without price increases if the cost of raw material is radically advanced.

**ABUNDANCE SOUGHT**—No one about the Department of Agriculture quite admits the complete reversal which has occurred in agricultural policy. But unquestionably the Wickard theory has become dominant, and abundance of all crops will be sought. With the possible exception of wheat and cotton, it is not anticipated that there will be any unwieldy surpluses when our aid-to-Britain program is well under way.

**FOODS RATED CLASS B**—Despite official desire to stimulate food processing, it is not expected that food manufacturing companies will get better than Class B priority rating on any requirements for equipment or materials on which formal priorities prevail. This means that aluminum equipment, stainless steel equipment and many other alloyed metals will be hard to get for some time to come.

**TIN ON CANS LIMITED**—OPM officials have "requested" reduction of the weight of tin on all food cans for which lighter coating is safe. At present the recommendations of can makers are being accepted as a guide. Only those canners who are processing fruits or vegetables which are hard on the container can expect as heavy a tin coating as last year. Even more drastic rules are being applied for non-food tinned-container practice.

**WICKARD TAKES CHARGE**—Chester Davis has been eliminated from the Agricultural Division of the old National Defense Advisory Commission, and NADC is about to be abolished. This means that the Department of Agriculture will be the "food administration" for the present, and perhaps permanently through the emergency.

**WORKING AGREEMENT** — Donald Nelson, director of purchases, and Leon Henderson, OPACS boss, have announced a working agreement with respect to prices. The Division of Purchases will keep OPACS informed of buying plans, and OPACS will indicate the results of price investigations. This means that Henderson may become price fixer for the purchase unit, still further centralizing authority in his office. This seems to be in line with the President's wishes as well as with the ambitions of Mr. Henderson.

**RECLAIMED TIN**—Collection of old tin cans in certain urban areas will begin for the purpose of reclaiming the tin, if the emergency supply of this metal gets seriously short. The Technical Committee has recommended to the Unit of Conservation of OPM that plans be laid for reclaiming about 12,000 long tons of tin per year, to be undertaken if need arises. Present detinning plants in New York, Pittsburgh, Chicago and San Francisco will be used first. Later expansion to cover the entire country is not recommended.

**INDIRECT FOOD TAX**—Regardless of the final magnitude of food taxes, and they will be large, these new burdens will be made as much indirect as possible. Congress and the President seek to hide the taxes from the housewife if practical, so that food price rises at retail will not be embarrassing politically. Thus excises on manufacturers are more fashionable with the tax-law makers.

**UNION DISCRIMINATION**—The Supreme Court has ruled unanimously that a company may not discriminate in its hiring of employees against an individual worker simply because of his union affiliation. Five members of the Court go further, but in this are opposed by two Justices. The majority argue that NLRB, in enforcing its authority in these matters, may both order employment of individuals so discriminated against, or require reinstatement, and may order reimbursement for pay lost.

**REFORM BY TAXATION**—Seldom has there been frank admission that the reform desires of New Dealers were to be accomplished by taxation. But the official statement by Price Administrator Henderson before the Ways and Means Committee on May 7 virtually said that the government intended to accomplish many of its business-control purposes by the form and placing of tax levies. Conservative observers in Washington anticipate that Congress will go along on much of this, probably without realizing fully the extent to which the new tax bill may become a tool of New Deal policy making.

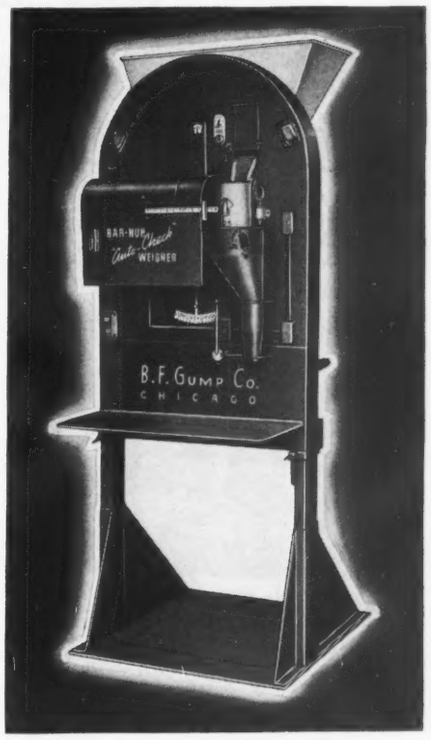

# A User Says

"The battery of three Bar-Nun "Auto-Check" Weighers has brought a new standard of accuracy and weighing efficiency to our Packaging Department.

"We like, especially, the extremely accurate, trouble-free method in which the Bar-Nun Weighers enable us to handle even the very fine pulverized grinds in regular stride; and the operators find them dependable and easy to adjust.

"Equipment of this kind is a great help."

**Perhaps this "extremely accurate, trouble-free method" can mean material and dollars saved in your plant.**




*The No. 15-N Bar-Nun "Auto-Check" Weigher, complete, ready to operate; capacity range, 2 ounces to 2 pounds.*

Users like these new, special features, available only in a Bar-Nun "Auto-Check" Weigher:

1. The unique power feed that handles stubborn, pulverized, non-free flowing materials as well as free flowing ones.
2. Pointer and dial that automatically indicates the accuracy of each weight just before it is discharged into the container.
3. Positive poise setting of the scale beam, graduated in actual ounces and fractions thereof—which eliminates plus and minus weight settings.
4. Trip lever control of discharge which holds spillage to a minimum.

Bar-Nun Weighers are made in two sizes for the packaging of powdered or granular materials. Let us know what material—size of containers—and speeds required. We'll send you complete information.

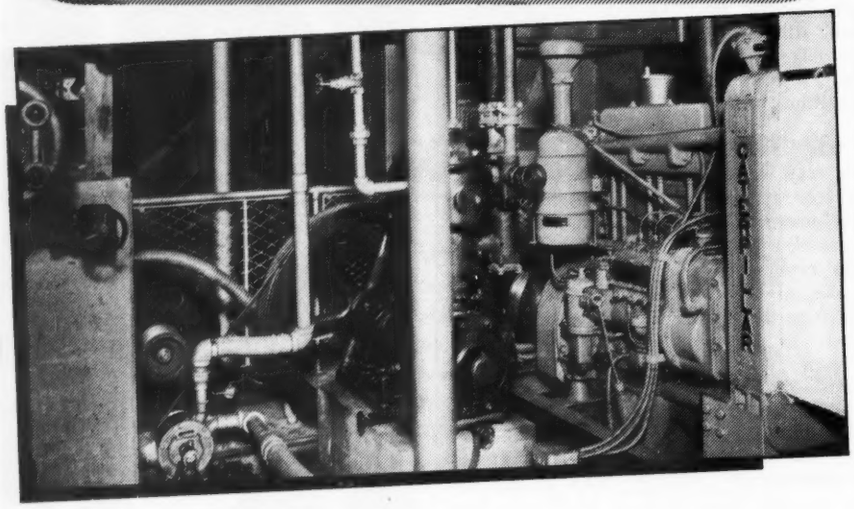
***Circulars on Request***

**B. F. Gump Co**

***Established 1872***

**454 S. Clinton St., Chicago, Ill.**

WHERE *DEPENDABLE*
POWER WAS DEMANDED—
"CATERPILLAR" DIESEL
WAS CHOSEN!




WHEN the New England hurricane of 1938 disrupted power lines and left the country estate and farm of C. E. Cotting of Berlin, Mass., in darkness and its refrigerating facilities helpless, the owner turned to "Caterpillar" Diesel for power.

A "Caterpillar" Diesel D6600 Engine was installed to drive a York ice machine, a generator and a small pump for the farm's 10,000 cold-storage boxes, and many other requirements.

Not only has this installation met Mr. Cotting's demand for power he could depend on, but in 18 to 24 hours of operation per day it uses only 27 to 36 gallons of 6c fuel.

"Caterpillar" Diesel Engines are like that. . . . When you've got one you've got a *cost-cutter*, a *profit-booster*, and a power-plant that isn't forever threatening to let you down. Even greater dependability is built into these world-famous engines today than ever before. . . . "Hi-Electro" hardening of crankshaft and cylinder liners gives a far greater wear-resistance than is possible with any other practical method of heat-treatment. Longer serviceable life and bigger value are combined with fuel and other savings that make these famous engines outstanding in their class.

SEND FOR FREE LITERATURE.

CATERPILLAR *DIESEL*
REG. U.S. PAT. OFF.
ENGINES AND ELECTRIC SETS

CATERPILLAR TRACTOR CO., *Dept. FI-6*, Peoria, Illinois
Send free information on "Caterpillar" Diesel Power. We require about _____ hp., or _____ kilowatts. Our monthly power bill is about $_____

NAME _____
ADDRESS _____
CITY _____ STATE _____


## Candy Sales Make Record

SALES of confectionery and competitive chocolate products made a new record in 1940, reaching 2.25 billion pounds, with a sales value of approximately $335,000,000 to candy manufacturers. This increase in poundage is between 8.5 and 9 percent over the 1939 figures and sets a new all-time record, while the dollar value is about at the 1928-1929 level. These figures are based on data from 273 manufacturers, whose production represents approximately 70 percent of the dollar value of products of the whole industry.

The survey, released June 1 by the U. S. Department of Commerce, also shows that the per capita consumption of confectionery reached a new high in 1940, at 16.9 lb. per person. This is nearly 50 percent more than the 11.6 lb. per capita consumed in 1925. The survey attributes the increase in consumption to the increased national income, up about 7.5 percent from 1939.

Raw material costs were not much different for the two years. Cocoa bean prices were up slightly, but sugar prices were down. Other materials entering into the products did not vary greatly.

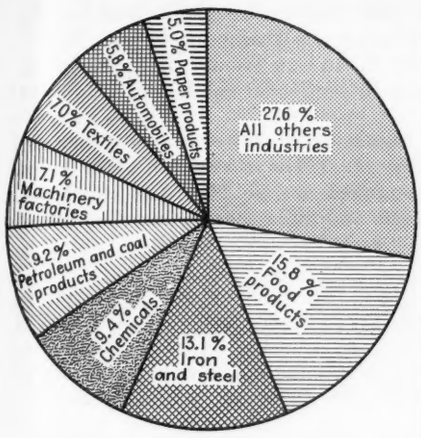
An index of commodity sales is presented for the first time in this survey. This index, on a value basis, uses the five years 1935-39 as a base. Figures are shown for chocolate manufacturers, and for confectionery manufacturing wholesalers and retailers. The index is carried back from 1940 to 1925.

A cocoa bean analysis is also featured in the survey. The factors of bean prices, total bean consumption, and national income have been correlated so that, given any two factors, the third can be estimated. Of course, the factor of defense activity adds a fourth dimension to this analysis, with all the attendant uncertainties. However, assuming that "normal" times do return, such an analysis as this may prove helpful.

## Political Move Causes Commodity Price Boost

STEADY INCREASES in food commodity prices during the month from mid-April to mid-May had little relation to the supply situation, except in the case of products necessarily imported from a distance. Instead, the justification for this price movement, if any, lay in the purely political activity of Congress in passing an 85 percent parity bill.

Following this move, wheat futures, for instance, rose rapidly. This rise was in spite of the huge carryover and large prospective 1941 crop, which promise a wheat supply for the 1941-1942 year that will be the greatest in history. Just how far this speculative, politically based




**This chart shows the expenditures of various industry groups in 1939 for new plant and equipment. Data from the U. S. Department of Commerce**

price rise will be permitted to go is a question.

Meanwhile, all indexes have jumped. The *N. Y. Journal of Commerce's* weekly index of general commodity prices rose from 86.4 on April 19 to 88.7 on May 17, and the same publication's grain index rose from 71.5 to 74.8 in the same period, while its food index rose from 74.7 to 79.3. The U. S. Department of Commerce's index of wholesale commodity prices increased from 82.9 on April 12 to 84.0 on May 10, while its index food prices went from 77.5 to 79.0 and its index of farm prices from 74.9 to 75.1 in the same period. *Business Week's* index of business activity, at 137.7 on April 12, rose to 142.7 on May. 10.

Spot prices of individual commodities made their usual varied pattern of changes in the month from April 19 to May 17, but mostly showed gains. Wheat, No. 2 dark winter, rose from 85¼c. to 91½c. Flour jumped 70c., to $5.90 per bbl. Corn, No. 3 yellow, rose from 67½c. to 71½c. Beef fell from 17c. to 16c., lamb was steady at 17c. while pork loins increased from 16½c. to 18½c. Lard soared, going from $8.45 to $9.65. Eggs upped from 22¾c. to 23¾c. while butter jumped from 33¼c. to 36¼c. Sugar was unchanged, at $3.38. Cocoa rose from $7.46 to $8.07 and coffee increased from 9¾c. to 10¾c. Canned vegetables and fruit showed various increases, while salmon prices were unchanged for the period.

## Huge Sugar Supplies Available for U. S.

IN A REPORT on sugar availability, released by the U. S. Department of Commerce on May 2, the following statements are made:

"If there were no quota limitations on marketings, there could be made available in the United States in 1941 some 12,428,000 short tons, raw value, under present production operations. (This includes only sugars from the Western Hemisphere and the Philippines). (See in accompanying table: the sum of 'reserves at end of year' and 'available for United States markets.') Allowing for a normal carry-over at the end of this year of 2,764,000 tons, there would be available for the American market about 9,664,000 tons.

"In summary, stocks at present are more than adequate, and, providing of course that shipping can be maintained, prices should be reasonable. However, since large surpluses exist in this hemisphere from nearby sources and can be made available to this market, shipping does not appear to be of prime importance.

"Sugar refining facilities in the United States are far in excess of normal requirements. Production by cane sugar refiners decreased by more than 1,000,000 short tons between 1929 and 1940, largely as a result of increasing beet sugar production and imports of off-shore refined sugar. This production capacity is still in existence and can be utilized if it becomes necessary for us to supply foreign markets with refined sugar."

**Probable Sugar Supply Situation for 1941**

*(In thousands of short tons — raw value)*

| | Stocks Jan. 1 | Est. production | Total supply | Home consum'n. | Exports to other markets | Reserves at end of year | Available for U. S. markets |
|---|---|---|---|---|---|---|---|
| Continental— | | | | | | | |
| Refiners and importers | 713 | ..... | 713 | ..... | ..... | 550 | 163 |
| Cane mills | 62 | 621 | 683 | ..... | ..... | 200 | 483 |
| Beet factories | 1,602 | 1,588 | 3,190 | ..... | ..... | 1,240 | 1,950 |
| Off-shore areas— | | | | | | | |
| Puerto Rico | 150 | 908 | 1,058 | 72 | ..... | ..... | 986 |
| Hawaii | ..... | 969 | 969 | 35 | ..... | ..... | 934 |
| Virgin Islands | ..... | 8 | 8 | 1 | ..... | ..... | 7 |
| Philippine Islands | 23 | 1,045 | 1,068 | 115 | ..... | 1 | 952 |
| Cuba | 1,345 | 2,726 | 4,071 | 175 | 200 | 500 | 3,196 |
| Dominican Republic | 24 | 500 | 524 | 22 | 100 | 25 | 377 |
| Argentina | 222 | 583 | 805 | 473 | 100 | 100 | 132 |
| Brazil | 94 | 1,326 | 1,420 | 1,203 | 10 | 94 | 113 |
| Peru | 80 | 511 | 591 | 111 | 200 | 50 | 230 |
| French West Indies | ..... | 115 | 115 | 6 | ..... | ..... | 109 |
| Haiti | 4 | 45 | 49 | 9 | 4 | 4 | 32 |
| **TOTAL** | **4,319** | **10,945** | **15,264** | **2,222** | **614** | **2,764** | **9,664** |

Actual deliveries for consumption; 1940, 6,891; 1939, 6,858.
Note: Exports of about 600,000 tons from the British West Indies not included above. These are credited to Britain but if not deliverable would be available for the United States market.

SEAMLESS STEEL CONTAINERS

IDEAL FOR FOOD PLANT USE

IN inter-departmental handling of raw products during manufacturing processes . . . in storage of materials . . . throughout the food plant—Hackney *Seamless* Steel Containers are proving their advantages over ordinary containers. Easy to clean and keep clean, they haven't a weld or a joint in their entire construction—they're cold-drawn to shape. Strong and durable, they stand up under the toughest use.

FURNISHED IN ALL POPULAR SIZES

Hackney Seamless Steel containers are used for holding foodstuffs, liquids, chemicals, ice, etc., as well as for food scraps. They are furnished in all popular sizes—5 to 60 gallons capacity . . . in several types of finishes—galvanized, tinned or black. Write today for complete details . . . no obligation.

Hackney

PRESSED STEEL TANK COMPANY

1349 Vanderbilt Concourse Bldg., New York
208 So. LaSalle St., Room 1573, Chicago
669 Roosevelt Bldg., Los Angeles
1457 So. 66th St., Milwaukee

*Containers for Gases Liquids and Solids*

# INDICATORS

CONFECTIONERY and competitive chocolate products sales in March, 1941, as reported by the U. S. Department of Commerce for 212 firms, totaled $23,984,000, an increase of 22 percent over March, 1940. Sales of these products in the first quarter of 1941 were 14 percent over sales in the first quarter of 1940.

FROZEN FISHERY PRODUCTS in cold storage on March 15, 1941, totaled 49,458,000 lb., compared to 45,592,000 lb. on the same date of 1940.

FLOUR PRODUCTION in April, 1941, for mills producing 65 percent of U. S. output, according to *The Northwestern Miller*, totaled 5,868,995 bbl., compared to 5,380,592 bbl. for the same mills in April, 1940.

KRAUT ACREAGE contracted for in 1941 is now estimated at 10,760 acres, compared to 10,290 acres contracted for in 1940. Total acreage harvested last year, including contract and open market, was 20,320 acres.

BEANS, snap, for canning and freezing, are expected to be planted on 74,530 acres in 1941, up 13 percent over 1940 plantings.

BEETS for canning in 1941 are expected to utilize 16,950 acres, an increase over 1940 of 27 percent.

CORN PLANTINGS for canning and freezing in 1941 are expected to reach 400,600 acres, an increase of 22 percent over the 327,170 acres planted last year.

PEA PLANTINGS for canning and freezing this year are expected to exceed 1940 plantings by 8 percent, reaching a total of 365,690 acres.

ASPARAGUS PACK so far this year is below 1940 figures, with the California total now estimated to reach 1,750,000 cases, compared to 2,200,000 cases packed last year.

LIMA BEANS, green, acreage for processing in 1941 is estimated at 61,900 acres, up 19 percent above the 51,890 acres planted in 1940, and comparing to 1930–1939 average plantings of 34,010 acres.

EVAPORATED MILK PRODUCTION in March, 1941, totaled 203,624,000 lb., 2 percent more than in March, 1940, and 27 percent above the 1935–1939 average.

MILK PRODUCTION on May 1 this year was 9 percent above the previous year and at a record high rate for the date.

SALES OF FLUID MILK in March, 1941, were 4.27 percent above sales a year before, according to Milk Industry Foundation.

BUTTER, creamery, produced in March, 1941, was 149,690,000 lb., more than 7 percent over production in March, 1940, and 19 percent above the March 1930–1939 average.

CHEESE, American, produced in March, 1941, was 44,635,000 lb., a record for the month and 10 percent above March, 1940, production.

SALES OF OLEOMARGARINE in March, 1941, as indicated by sales of internal revenue stamps, were 29,850,818 lb., 12 percent above sales in March, 1940.

VEGETABLES, frozen, in storage on May 1, 1941, totaled 48,370,000 lb., compared to 49,147,000 lb. one year before.

FRUITS, frozen, in storage on May 1 of this year were 81,812,000 lb., compared to 76,069,000 lb. on May 1, 1940, and to an average of 68,535,000 lb. for the date in 1936–1940.

BUTTER, creamery, in storage on May 1, 1941, was 17,727,000 lb., compared to 9,504,000 lb. a year before and to a May 1 average of 22,392,000 lb. in 1936–1940.

CHEESE, all kinds, in storage on May 1 of this year totaled 108,047,000 lb. The quantity one year previous was 78,917,000 lb. and an average of 76,285,000 lb. was in storage on the date in 1936–1940.

EGGS, case equivalent, in storage on May 1, 1941, totaled 5,876,000 cases, compared to 5,611,000 cases on May 1, 1940, and to an average in 1936–1940 of 5,992,000 cases for the date.

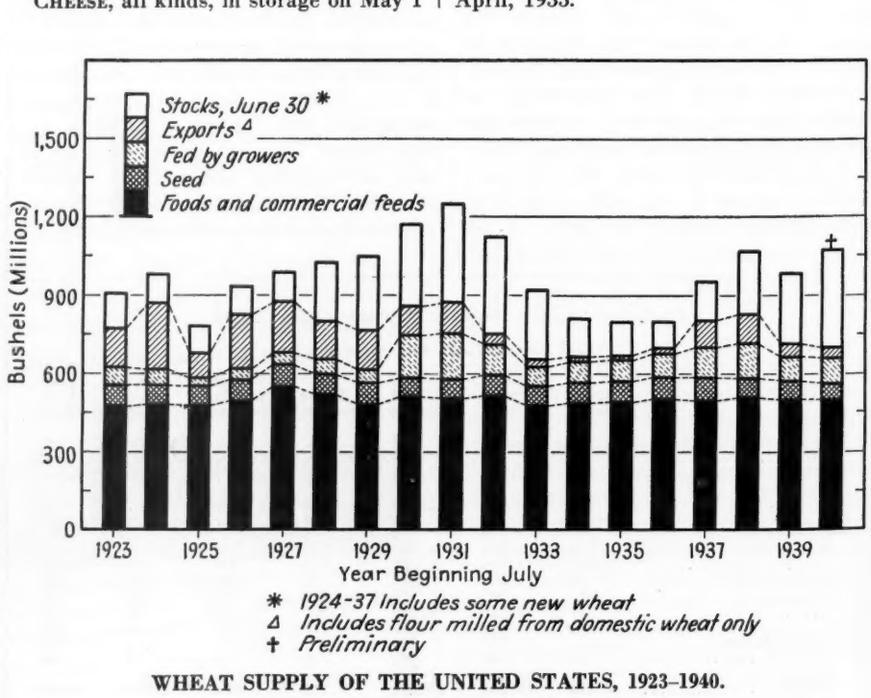
POULTRY, all kinds, in frozen storage on May 1, 1941, amounted to 101,000,000 lb. The quantity a year before was 86,226,000 lb. and the average for May 1 in 1936–1940 was 72,212,000 lb.

MEAT, all kinds, in cure and storage on May 1 of this year totaled 965,381,000 lb., compared to 764,769,000 lb. on May 1, 1940, and to an average of 711,427,000 lb. on May 1 in 1936–1940.

LARD IN STORAGE, May 1, 1941, totaled 320,191,000 lb., and 6,508,000 lb. of rendered pork fat was in storage on the same date. The total for the two products on May 1, 1940, was 266,052,000 lb. and the average for May 1 in 1936–1940 was 162,107,000 lb.

WEEKLY WHOLESALE FOOD PRICE INDEX of Dun & Bradstreet stood at $2.93 on May 13, 1941, compared to $2.27 on May 14, 1940, and was at the highest figure in four years.

COST OF LIVING INDEX of National Industrial Conference Board at the end of April, 1941, was 86.9, compared to 86.3 at the end of March, an increase of 0.7 percent for the month. This figure is 21.2 percent above the depression low of April, 1933.




**WHEAT SUPPLY OF THE UNITED STATES, 1923–1940.**
**(Data from U. S. Department of Agriculture)**

## Boiler Water Conditioning

(*Continued from page 75*)

much more rapid and complete than the cold process; hence the installation may be considerably smaller for the same capacity. Since the water must be heated for boiler feed purposes anyway, the hot process is to be preferred. The use of an open heater for this purpose aids deaeration. Cold process softeners may use sand filters; but in the hot process non-siliceous material should be used, as silica, objectionable in boiler water, is soluble in hot alkaline solution.

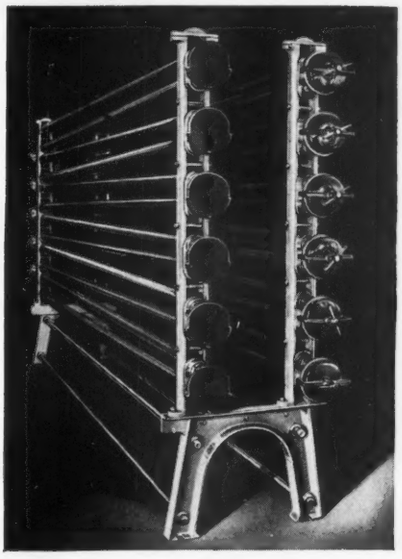
Removal of air[3,4,5] and other gases is an important feature of the preparation of water for boiler feed and should not be overlooked. Deaerating feedwater heaters offer the most satisfactory solution of this problem. Where such a heater is not available or where the results obtained are not considered satisfactory, chemical scavenging agents may be used. Sodium sulphite is an effective example.

A newcomer to the field within the last ten years has been the primary phosphate treater.[6] Sodium orthophosphate and caustic soda are used as precipitants in a hot process softener. This procedure has made possible water with lower residual calcium than is obtainable in the best operated lime-soda plant. The water may require acid treatment, however, in order to prevent excess alkalinity in the boiler. These units need continuous expert supervision and are not yet ready to be generally accepted.

Of even more recent development are the so-called hydrogen zeolite softeners.[7] These are charged with various organic resins and when regenerated with acid, will replace sodium, magnesium, calcium and other positive ions with hydrogen ions so that the mineral matter will leave the softener in the form of acids rather than as carbonates, chlorides, sulphates, etc. of sodium as would be the case in the ordinary zeolite softener. The water may then be passed through a second bed to remove the acid or negative ions. The water from this two-stage process contains $CO_2$, which can be liberated by aeration, and will have only a few parts per million of the original mineral matter remaining. These are still in the experimental stage but open a very promising field.

Thus it can be seen that a definite need for water conditioning does exist. There is no general formula for good results. Careful application of appropriate methods, whether they consist of internal or external treatment or a combination of both, will produce less carry-over as well as effecting operating economies.


**CHESTER COOLERS**



***Stainless Steel–Internal Tube Milk System***

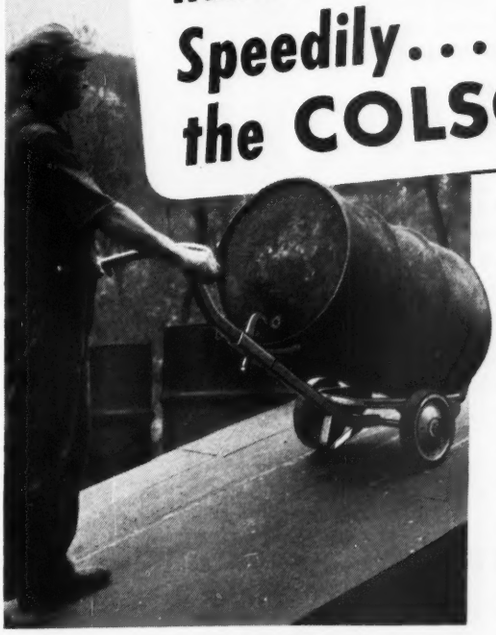
Made with seamless, stainless steel tubes, heads and doors. The tubes are welded into the heads so that there is no crack or crevice. The doors are smooth polished cups, interchangeable and removable for cleaning. Design permits the manufacture of an all stainless steel unit at a very reasonable cost.

*Write for complete information*

**CHESTER DAIRY SUPPLY COMPANY**

9th & Hyatt Sts. *Sanitary Heat Exchangers* Chester, Pa.

**Handle Barrels and Drums Speedily... Safely... the COLSON way**



WHETHER you handle one barrel or drum a day, or a thousand, Colson Drum Trucks mean more productive handling for you and greater safety for your operators.

No lifting is necessary to load the truck. Safety is assured because proper balance of the load eliminates strain. The shape of the handle protects the operator at all times. The adjustable hook is quickly set for barrels or drums 24" to 40" high. Write for descriptive folder.

**THE COLSON CORPORATION**

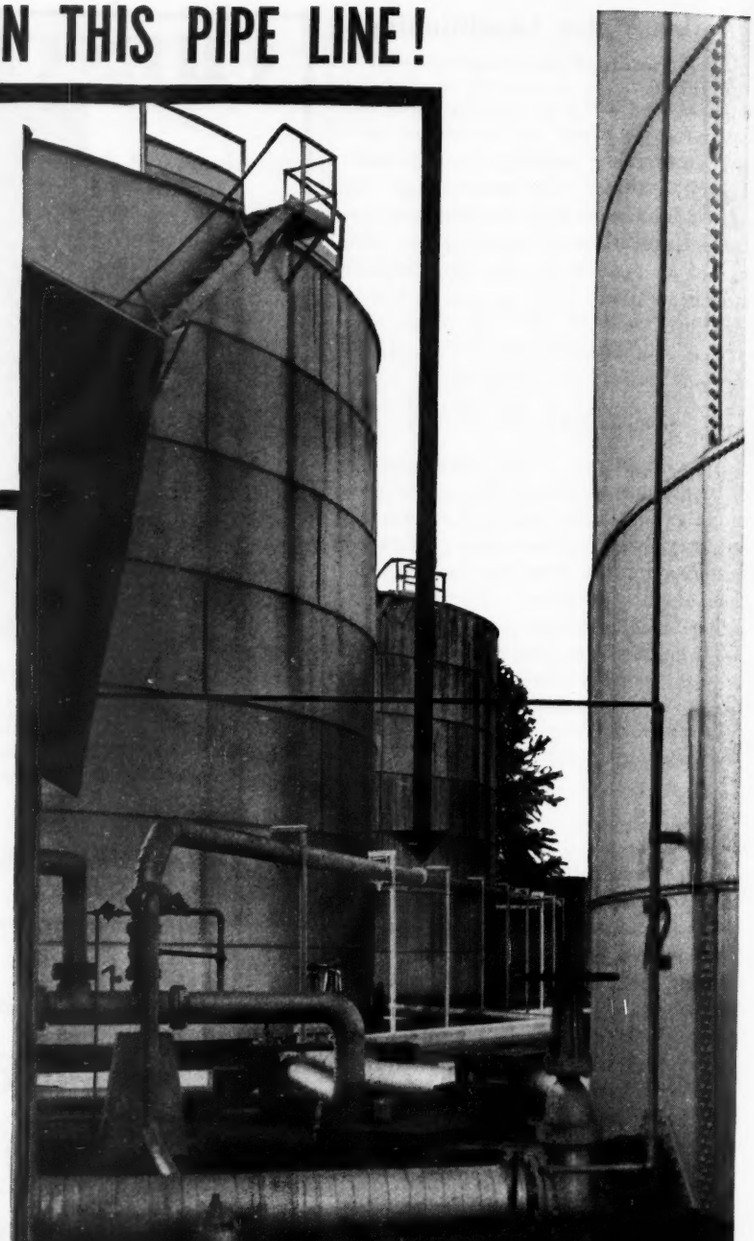
ELYRIA, OHIO

*Offices and Agencies in Principal Cities*

CASTERS • INDUSTRIAL TRUCKS AND PLATFORMS • LIFT JACK SYSTEMS

# NO "FROZEN" ASPHALT IN THIS PIPE LINE!

## K&M insulation keeps asphalt hot and free-flowing in this long, outdoor line



HERE is an outdoor pipe line 868 feet long used to carry asphalt in a large western refinery. No matter how hot it is at the start, asphalt would cool down within forty or fifty feet and practically "freeze solid" in an ordinary pipe line. But not in this one! A specially engineered installation prevents it, with the help of Keasbey & Mattison "Featherweight" 85% Magnesia insulation.

Underneath the line carrying the hot asphalt, a small steam line was installed. The pair were then enclosed together and protected against heat loss by a single covering of K&M "Featherweight" 85% Magnesia. The Plant Manager says that a virtually constant temperature is maintained at all times, despite the fact that there are many hours, especially at night, when the asphalt is not flowing at all!

Such an installation as this saves its moderate cost many times over. But only high-efficiency insulation, such as K&M "Featherweight," makes it feasible. The specialized line of K&M asbestos and magnesia insulation materials is saving heat, fuel and dollars for plants in every industry.

K&M engineers, working with K&M Distributors strategically located throughout the country, can point the way to real savings in your plant, too. Write Dept. 11 for full details.

● Showing the hot asphalt-carrying pipe line in a large western refinery. This line is insulated with K&M "Featherweight" 85% Magnesia, which was supplied and installed by Pacific Building Materials Company, Portland, Oregon.

**K&M "Featherweight" 85% Magnesia**

**KEASBEY & MATTISON**

**COMPANY, AMBLER, PENNSYLVANIA**

K&M best in asbestos

# Men, Jobs & Companies

## INDUSTRY

**Amendt Milling Co.,** Monroe, Mich., has been awarded the contract for a $60,000 flour mill to replace the plant recently destroyed by fire.

**Anheuser-Busch, Inc.,** is erecting a four-story $400,000 fermenting cellar as an addition to its South St. Louis brewery.

**A. & P.** will expend $50,000 in building and equipping a 20x105-ft. four-story addition to its baking plant in Cleveland.

**Barricini Candy Shops** has leased a seven-story structure containing 120,000 sq. ft. of floor space, in Long Island City, N. Y., for manufacture of candy to be distributed to its stores in Manhattan, Brooklyn and Queens. This is Barricini's fourth expansion move in 14 years.

**Berrien Springs (Mich.) Fruit Packers, Inc.,** has been incorporated for the cooperative handling of fruits and vegetables. Capitalization was given as $30,900 preferred and $20,000 common.

**Columbus (Ohio) Packing Co.** will expand its plant with the expenditure of $50,000 for stockyards, offices, other buildings and equipment.

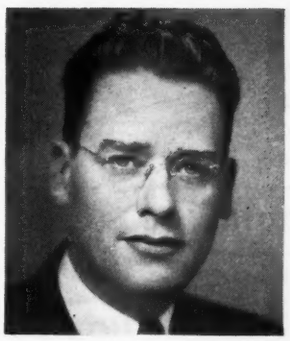
**Dexter & Sons,** Ellensburg, Wash., after several years' experimentation, has introduced a non-dripping, non-running honey processed to the consistency of butter and packaged in 14-oz. cartons under the trade name of "Honey Butter."

**Hathaway Bakeries, Inc.,** is remodeling its Providence, R. I. plant, installing ovens, mixers, refrigeration and a new fermentation room. The company, after constructing new offices and purchasing 30 trucks, is considering a one-story addition to its Providence bakery.

**H. P. Hood & Sons** has purchased 94,000 sq. ft. of land in Worcester, Mass. for construction of a $100,000 brick and steel milk plant.

**Meadors Manufacturing Co.,** will invest $100,000 in building and equipping a new candy factory, 70x423 ft., in Greenville, S. C.

**Morgan Packing Co.,** Austin, Ind., is increasing by 60 percent the capacity of its tomato canning factories at Franklin, Edinburg, Columbus, Brownstown, Austin and Scottsburg, Ind.



**ARTHUR G. DUNN**
**American Spice Trade Association has re-elected as president Mr. Dunn, head of a well-known New York spice brokerage house. John Max Weyer of Van Loan & Co., Inc., was re-elected vice-president of the Association, and Avery F. Payne was chosen treasurer, succeeding A. A. Sayia.**

**F. J. ANDRE**
**Sheffield Farms Co., Inc., New York, has elected him president to succeed L. A. Van Bomel, recently promoted to the presidency of National Dairy Products. Mr. Andre, former president of Telling-Belle Vernon Co., leading milk and ice cream distributors, will begin his new duties immediately.**

**F. P. SIEBEL, JR.**
**Siebel Institute of Technology, Chicago, has elected as president Fred P. Siebel, Jr., who has been associated with the staff as technical advisor and counsellor since 1924. He succeeds his father, Dr. F. P. Siebel, Sr., who will remain active in the organization as chairman of the board.**

**F. J. O'Hara & Sons, Inc.,** Boston, has ordered ten diesel fishing trawlers from a South Portland, Me., shipbuilder, to replace the big steel trawlers taken over by the government for minesweeping purposes. Six of the vessels will be 58 ft. in length, and the other four will be 82 ft. in length, to provide the Boston fishing fleet with small fast craft.

**Pabst-ett Corp. and Dairy State Cold Storage Co.,** Plymouth, Wis., have inaugurated a construction and remodeling program that will provide for a total storage space for 20,000,000 lb. of cheese. A new two story 110x110 cold storage building will be built as part of the expansion move.

**Pepsi-Cola Bottlers,** St. Louis, is building a two story bottling plant, 75x146 ft., costing $200,000 with equipment.

**Plankinton Packing Co.,** Milwaukee, Wis., is building a $125,000 addition to its plant there.

**Quaker Oats Co.** has purchased the properties of Kimbell-Diamond Milling Co., Sherman, Tex.

**Ralston-Purina Co.,** St. Louis, has begun construction of a $35,000 mill in Omaha, Neb. The one-story 40x120 ft. building is expected to be completed in July. Ralston has also leased in St. Louis a four-story brick building containing 22,000 sq. ft. of floor space as a warehouse.

**Swift & Co.,** which recently entered the Greater New York ice cream market, has purchased the business and assets of the Park Lane Ice Cream Co., New York. Swift has also made new installations in its New York plant, the former Eskimo Pie Corp. building.

**Wilson & Co.** is erecting a new meat packing plant, one and two stories high, with offices and storage space, in New London, Conn. . . . The negotiations carried on last month between Wilson officials and United Packing House Workers (C. I. O.) at Cedar Rapids, Ia., failed to make the company give in to a closed shop. About 1,400 workers were involved, and a strike appeared imminent.

## PERSONNEL

**Trevor Arkell** has been named manager of the tea department of Kelly, Douglas & Co., Ltd., tea and coffee importers and food manufacturers of Vancouver, B. C.

**W. Clark Arkell** succeeds his father, Bartlett Arkell, as president of Beech-Nut Packing Co., Canajoharie, N. Y.

**Dr. C. H. Bailey,** professor of biochemistry, University of Minnesota, and vice-director of Minnesota Agricultural Experiment Station, has been appointed acting

# These "EXTRAS" Cost You Nothing... *AND MAY SAVE YOU MONEY*

COMPLETE SERVICE

PERIODIC INSPECTIONS

LIABILITY INSURANCE

ALL SAFETY PRECAUTIONS

MOST EFFICIENT METHOD

BETTER RESULTS

**From an Industrial Fumigation Engineer—located near you**

TURN your pest control problems over to an Industrial Fumigation Engineer—and forget them!

He will assume complete charge—taking full responsibility.

Qualified by specialized technical training and long experience, the Industrial Fumigation Engineer knows insects and rodents; knows their habits, life cycles and how to control them under all conditions.

As part of his service, he supplies all materials; he recommends the type and frequency of fumigation for best results in your plant; and he sees the job through. His workmen are schooled in safeguarding your employees and merchandise. And he carries Fumigation Liability Insurance.

Write us and we will gladly ask the Industrial Fumigation Engineer nearest you to call, make a survey of your conditions and needs, and submit his findings. This involves no expenditure on your part.

*Liquid HCN is the fumigant of choice with Industrial Fumigation Engineers throughout the country. Its remarkable killing power, cleanliness in use, and surprisingly low cost permit complete pest control with greatest economy. Write for full information on the advantages to you of Liquid HCN.*

**INFESTATION COMPLAINTS ENDED, COSTS REDUCED BY 50 PERCENT**

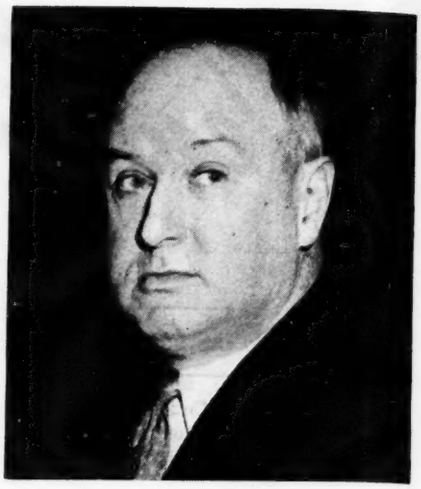
● By calling in the specialized services of an Industrial Fumigation Engineer, a leading meat packing plant eliminated all complaints of infestation. In addition, the plant manager was able to show a saving of over 50 percent in fumigation costs. Well-planned use of Liquid HCN was responsible for this outstanding job.

**American Cyanamid & Chemical Corporation**

INSECTICIDE DEPARTMENT

30 ROCKEFELLER PLAZA • NEW YORK, N. Y.

KANSAS CITY, MO. • AZUSA, CALIF.

**JAMES A. FARLEY**

**The former Postmaster General has been elected president of the Coco-Cola Bottling Co., Boston. He will retain chairmanship of the Coco-Cola Export Corp., to which he was elected last fall. Oscar G. Davis, manager of the bottling company, has been made a vice-president and director.**

dean of the University of Minnesota Department of Agriculture, effective July 1.

**Harold F. Baker,** Fort Atkinson, Wis., has purchased the Evansville (Wis.) Ice Cream Co. from W. P. Fleming.

**Joseph W. Cannon,** until recently Boston manager for Standard Brands, Inc., has been promoted to general manager of the hotel and restaurant division of that company in the United States and Canada.

**L. G. Cosgrove** has been transferred from the New Orleans office of Wesson Oil Co. to the New England office, succeeding Dave Sheehan, who has resigned.

**James F. Elliott,** Quincy, Mass., has been named general manager of the widely scattered operations of Hathaway Bakeries, Inc.

**M. E. Griffin,** manager of the Sheboygan, Wis., office of Armour & Co., has become manager of the firm's Racine, Wis., office, succeeding the late James H. Nield.

**L. Owsley Haskins,** former vice-president of Consolidated Biscuit Co., has been elected president of Morton Packing Co., Louisville, Ky., packers of chicken products.

**Harry T. Hedge,** of the Chicago executive offices of Quaker Oats Co., has taken over the Jacksonville, Fla., office as manager. He replaces Paul G. Menzel, retired.

**Edward G. MacDougall** has resigned as director and board chairman of Libby, McNeill & Libby, retiring after 40 years of service with the company.

**Col. Edward T. Miller** has been announced as new secretary of National Pickle Packers Association, succeeding Frank D. Gorsline, resigned.

**C. T. Newell,** Fort Worth, Tex., has taken over chairmanship of the Lone Star section of American Association of Cereal Chemists.

**Dr. A. Nicolaus,** in charge of manufacturing operations at Fritzsche Bros.' Clifton, N. J., plant, has become a director of the firm.

**R. A. Porter,** formerly plant manager of the H. J. Heinz plant at Chambersburg, Pa., has become superintendent of the Bowling Green, Ohio, Heinz plant, succeeding C. A. Bartlett.

**James A. Shealy,** San Francisco, heads the newly organized Modesto Canning Co., capitalized at $200,000. The firm plans a 500,000 case pack of fruits and vegetables this year.

**Peter A. Sunderland** has resigned from the staff of Pacific Fisheries Experimental Station, Prince Rupert, B. C., to join British Columbia Packers, Ltd., at Vancouver. Ernest P. Sidaway has been appointed scientific assistant in research engineering at Pacific Fisheries.

## DEATHS

**John J. Aman,** 68, president and one of the founders of the Chicago Poultry Board, April 16. He was a hero of the S. S. Eastland disaster.

**George H. Atkins,** 53, manager of the Stahl Packing Co., at Evansville, Ind.

**William E. Beardslee,** 78, nationally known leader in the powdered milk industry, April 26, in Arcade, N. Y. He was general superintendent of Merrell-Soule Co. until it was purchased by Borden Co. in 1928, when he continued with Borden in an advisory capacity.

**Marcus D. Brooks,** 67, president of A. E. Brooks & Co., Grand Rapids, Mich., candy manufacturers, May 8, in Grand Rapids, Mich.

**Roscoe W. Finch,** 35, Pittsburgh district manager of Morrell & Co., meat packers, May 8, in Connellsville, Pa.

**Joseph Seeman,** 80, president of Seeman Bros., Inc., and pioneer in the wholesale grocery business, April 23, in New York.

**Wade Livingston Street,** at one time first vice-president of National Canners Association and formerly with Snider Packing Corp., May 4, at Coral Gables, Fla.

## ASSOCIATED INDUSTRIES

**American K. A. T. Corp.** has opened a Philadelphia office, supervised by Frank Campbell Coe, to sell and serve the users of K. A. T. all-collodial water treatment.

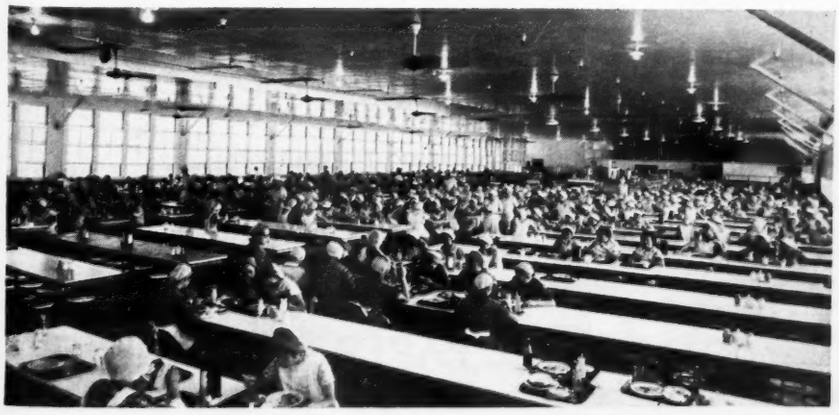
**Brunner Manufacturing Co.,** Utica, N. Y., has announced the election of George L. Brunner, Jr., as executive vice-president.

**Continental Can Co.** reports the death of its former president and director, Oscar Caperton Huffman, 64, on May 5, in New York. Mr. Huffman established both the Virginia Can Co. and the United States Can Co.

**Crane Co.,** Chicago, has elected John H. Collier as president to fill the vacancy created by the sudden death of Charles B. Nolte on April 29. Mr. Collier has been president of Cie Crane, in Paris, and chairman of Crane Ltd., London.

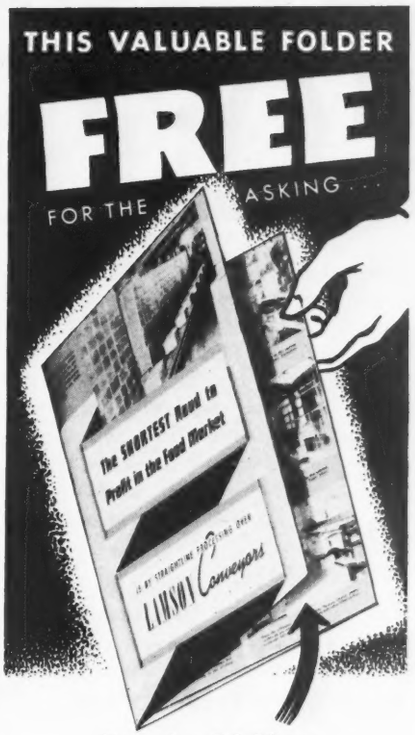
**Magnus, Maybee & Reynard Inc.** has announced the election as vice-president of Talmadge B. Tribble, general manager of the mid-western territory.

**Reynolds Metals Co.** has appointed J. Louis Reynolds general sales manager of the firm for the duration of the present national emergency. J. P. Macauley, vice-president in charge of sales, is devoting his full time to the Louisville, Ky., plants where the company is manufacturing aluminum-alloy products.



**LARGEST DINING ROOM IN HAWAII**

**Dole Hawaiian Pineapple Co., Ltd., Honolulu, operates for its cannery workers a cafeteria with a seating capacity of 2,000 and equipment to cook and serve 10,000 meals a day at the rate of 100 meals per minute. The cafeteria, which is run on a non-profit basis, served 478,338 meals to employees during 1940.**


**Contains 16 Plant Photos of "THE SHORTEST ROAD TO PROFIT IN THE FOOD MARKET"**

Yes, there is a "short road to profit" in the food market. It's the straight-line road set by Lamson Food Package Conveyors in scores of famous plants all over America.

Wait—get the facts before you decide! And be fair to yourself. Just examine the 16 plant photographs contained in this folder . . . photographs taken in plants you know and respect. And examine the blueprint plan showing the basic Lamson principle of stockroom movement and control.

It's all in this valuable folder . . . all explained so simply and clearly that you'll understand it in a flash . . . and all detailed so simply that you'll realize how amazingly inexpensive Lamson Food Package Conveyors are to install and operate. Don't wait. Send the coupon now.

**LAMSON**

FOOD PACKAGE CONVEYORS

**LAMSON CORPORATION**
**506 Lamson Street**
**Syracuse, N. Y.**

*Without cost or obligation, please send by return mail a free copy of your latest pamphlet, "The Shortest Road to Profit in the Food Market."*

Name..... Title.....

Company .....

P.O..... State.....

# TASTELESS PAPER

Who wants to eat paper anyway? Nobody. That's not the point. Ordinary paper has a "papery" taste that is often picked up by the food wrapped in it. Not so with Patapar. That is one reason why so many products are packaged in it. Patapar's tasteless quality is a safeguard to natural flavor.

## But this is only ONE of PATAPAR'S features

Patapar is not only tasteless but also odorless, grease-resisting, insoluble, and yes—boilproof!

What does this mean to you? It means that when you use Patapar you will not be gambling with protection. You will have a wrapper that you can trust *through* and *through*.

## Patapar is the paper for

| | | |
|---|---|---|
| Bacon | Ham | Poultry |
| Butter | Ice Cream | Sausage |
| Cheese | Meats | Shortening |
| Fish | Milk bottle hoods | Tamales |
| Frozen foods | Milk can gaskets | Vegetables |

*and many other products of the Food Industry*

If you would like to test Patapar for any of these or other uses, samples will gladly be furnished. When writing, kindly give details about your requirements.

**PATAPAR**
REG. U. S. PAT. OFF.
**Vegetable Parchment**
INSOLUBLE · GREASE-RESISTING
ODORLESS · TASTELESS · BOIL-PROOF

**PATERSON PARCHMENT PAPER COMPANY**

*Headquarters for Vegetable Parchment Since 1885*

Bristol, Pennsylvania

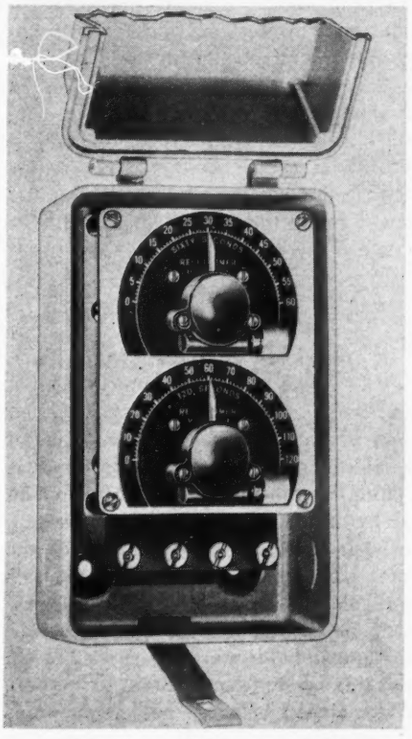
*West Coast Plant:* 340 Bryant St., San Francisco, Cal.
*Branch Offices:* 120 Broadway, New York, N. Y.
111 W. Washington St., Chicago, Ill.

# Food Equipment News

## Double Reset Timer

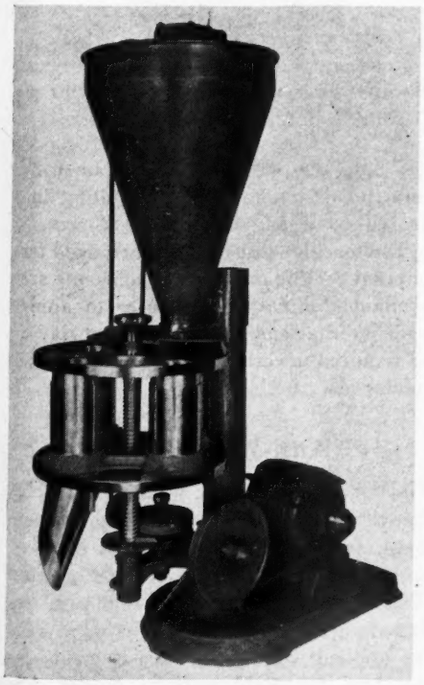
FOR CONTROLLING industrial operations that require an adjustable and rapidly repeated time cycle, R. W. Cramer Co., Centerbrook, Conn., has brought out an automatic double reset timer. This device consists of two reset timer mechanisms mounted upon a control panel and controlling common electrical circuits. Micrometer adjustment and "band-spread" time scales are provided to facilitate accurate setting.

The timer is available in many combinations—for instance providing a 10-second impulse every 90 seconds for signaling or heat control purposes is a typical combination which embodies a 120- and a 15-second timer. In this combination the first timer is set to close the control circuit in 90 seconds while the other timer is set for 10 seconds. In operation, the first timer closes the control circuit at the end of 90 seconds. The second timer then operates simultaneously with delivery of the desired impulse for a period of 10 seconds. The first timer has meanwhile reset and is again put into operation at the end of the 10-second interval when the second timer opens the control circuit and cuts off the impulse. The 90-second interval then recurs. Various combinations of individual timers for 15, 30, 60 and 120 seconds maximum are available.



Double reset timer for processing operations.

The instrument is housed in a gray enameled metal housing providing dust-proof protection and equipped with a lock to prevent alteration of timing after setting.



Package filling machine for a wide range of container sizes.

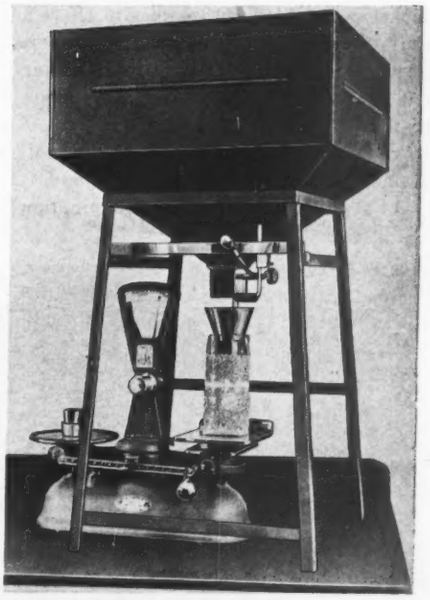
## Package Filling Machine

FRAZIER & SON, Belleville, N. J., has brought out a new model of their "Whiz-Packer" filling machine, designed to fill a wider range of container sizes at high speed. This machine is equipped with quick-change measuring cups of twice the capacity formerly used. As a result, the discharge is said to be doubled and the size range increased to from five grains to five pounds for the same machine.

Such dry food products as flour, rice, macaroni products, coffee, tea, spices, seeds, candy, nuts, popcorn and frozen foods—in fact any dry or free-flowing product, can be filled on this machine. Its capacity is variable, there being seven speeds from 10 to 80 packages per minute. In the regular machine, aluminum is used for all parts coming in contact with the product. However, special material can be furnished where the product is abrasive in action, or for certain products the contact parts are furnished in stainless steel.

## Bagging Machine

A HAND-OPERATED MACHINE for uniformly filling free-flowing food products into bags has been developed by the Exact Weight Scale Co., Columbus, Ohio, under the name of "Paxall". The machine consists of a hopper constructed of rust-proof material and supported on legs. This hopper is equipped with a spout available in three different sizes for different bag openings. Included with the machine is a Model 173 Exact Weight scale upon which the bag is placed during the filling operations. This scale will handle packages in a range from 3 oz. to 10 lb. and can be modified for smaller packages.



Hand-operated bag-filling machine for free-flowing food commodities.

The opening of the hopper into the spout is equipped with an adjustable valve control by means of which the amount discharged at each opening can

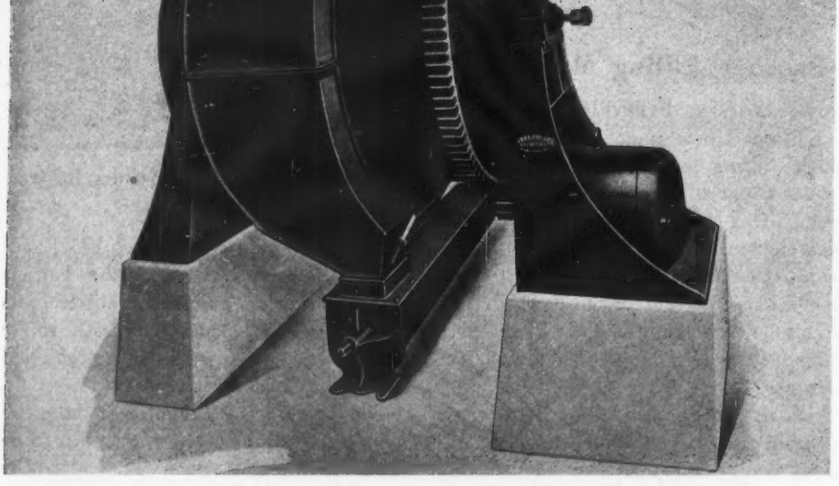
be exactly regulated to suit the operation being carried out. The operation is manual, the bag being placed on the scale platform by hand, the spout inserted in the opening and the valve on the hopper opened by means of a hand-operated handle.

## Stainless Steel Ball Mill

ABBÉ ENGINEERING CO., 50 Church St., New York City, has introduced a new type of stainless steel ball mill for grinding or processing materials that must not be contaminated in any way by the metal from which the mill is constructed and also to control temperature conditions during operations. The cylinder of the mill is made of stainless clad steel, welded to stainless clad steel heads. Inside the cylinder, a series of rounded baffle bars are welded to produce a wave-like interior surface thus providing a cascading motion for the material and the grinding medium during rotation of the mill.

In order to cool the mill during grinding, or to heat it, if that is necessary, dished heads are welded to the outside of the mill heads and connected to a source of cooling water or heating medium which circulates through a jacket surrounding the cylinder. This jacket is provided with baffles to effect a uniform distribution of the cooling or heating medium. A rotary joint at one end of the mill permits the introduction of the cooling medium while the mill is in operation and it is removed through a similar rotary joint at the other end.

As a precaution against contamination of material during heating and discharge, a stainless steel housing fits around the entire cylinder, covering the manhole area. A large opening feed door at the top, a cleanout door at the side, and a slide gate discharge at the bottom are also provided. Thus, without coming into contact with the outside atmosphere, the mill can be fed and discharged. Where it is desired to evaporate the product during milling, to operate under vacuum, to add liquids or gases, or to operate under pressure, a combination stuffing box can be supplied with this mill. This stuffing box provides a connection for the introduction of the heating or cooling medium and a connection for adding liquids or gases of for evacuation.



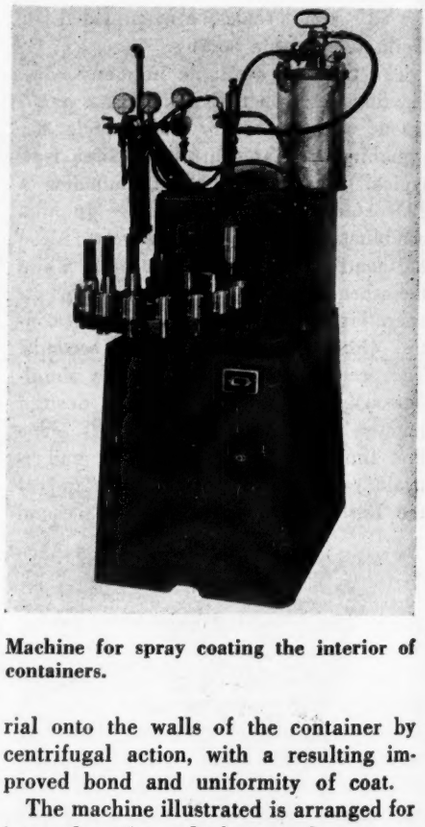
Stainless steel grinding mill.

## Container Coating Machine

F. J. STOKES MACHINE CO., Philadelphia, Pa., has developed a machine for spraying lacquer or other protective internal coatings into cans and other types of metal containers. This machine applies coatings at the rate of 40 or 50 per minute by means of an automatic spray gun. It is designed for handling any of the many lacquers or other coating materials available for such application. In operation, the containers are placed by an operator in holders or cups carried by an indexing dial from station to station. There are 16 of these holders in order to provide ample working space for efficient handling of the containers.

Each container controls its own coating operation, an indexing device being provided which is actuated by each individual container as it passes into the coating station. This is done in order to prevent waste of material and the smearing of the mechanism in case the operator fails to place a container in a cup. The containers are lifted to bring the spray nozzle to a suitable position from the bottom, the control for starting and stopping the spray being adjustable and so arranged that a coating can be applied either as a nozzle enters or is withdrawn. If desired, coatings can be applied while the containers travel in both directions, thus applying a double coat to insure perfect coverage.

A feature of the machine is the high speed at which the container is rotated during the coating operation. This high speed tends to plaster the coating material onto the walls of the container by centrifugal action, with a resulting improved bond and uniformity of coat.



Machine for spray coating the interior of containers.

The machine illustrated is arranged for internal coating only, but attachments are available for easy change-over to apply both internal and external cement-rings., as required in certain types of collapsible tube seals.

## Anti-Mold Paint

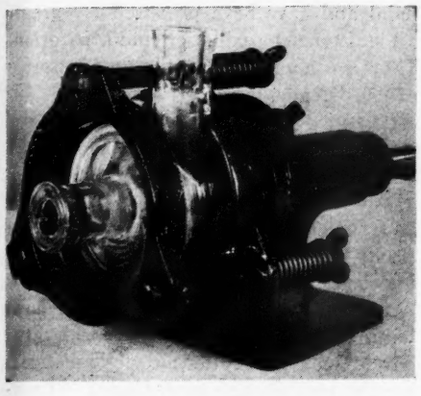
HERCULES POWDER CO., Wilmington, Del., has developed, from a chlorinated rubber base, an anti-mold paint, useful in solving the mold problems in food plants. The anti-mold qualities of this paint is based on two factors: first, the paint can be applied without oil, thus it furnishes no food for mold growth; second, an active fungicidal ingredient can be incorporated in the chlorinated rubber

base to kill any mold spores that may light upon the paint surface.

This anti-mold paint can be applied to all masonry, steel or wood surfaces. It is particularly recommended by the makers for use in bakeries, breweries, jelly, jam and preserve works, pickle plants, and dairy products plants such as cheese factories and creameries.

## Small, All-Glass Pump

NASH ENGINEERING CO., South Norwalk, Conn., has designed a new model of the "Pyrex" all-glass pump in a much smaller size than heretofore available. This new pump is a ¾-in. x 1 in. pump with a capacity of 10 gal. per min. It is of the volute centrifugal type and the casing



Small-size all-glass centrifugal pump.

and impeller and other parts coming in contact with the liquid being pumped are all of glass. In addition, the transparency of this glass makes it possible to observe the interior condition of the pump and so prevent contamination of the liquid being pumped. In the design, a mechanical seal replaces the conventional stuffing box and a safety unloading device is provided in order to avoid fracture of the glass casing. Because of the characteristics of the "Pyrex" glass used, this pump will handle either hot or cold liquids with equal facility.

## Longer-Wearing Valve Stems

HANCOCK VALVE DIVISION, Manning, Maxwell & Moore, Inc., Bridgeport, Conn., has brought out a new alloy, Hancodur, for valve stems and bonnets. This is a self-lubricating alloy developed expressly for use in Hancock valves. It is claimed by the makers that repeated breakdown tests indicate that valve stems and bonnets made from this alloy outwear other metals used for this purpose. The alloy has a tensile strength of 90,000 lb. per sq.in. The self-lubricating characteristic is for the purpose of resisting galling and wear.

Low-head heavy duty sifter.

## Heavy-Duty Sifter

ALLIS-CHALMERS MFG. CO., Milwaukee Wis., has brought out a heavy-duty, low-head sifter with side opening box for quick and easy removal of sieves. The sifter is motor driven from a motor mounted on the same bed plate as the machine. It is made in sizes from 10 sq.ft. of cloth area to 60 sq.ft. It is recommended by the maker for use in flour mills, candy manufacturing plants, and bakeries, for the grating and sifting of dry granular products.

## V-Belt

THE B. F. GOODRICH CO., Akron, Ohio, has brought out a line of open-end V-belting for application on drives where endless V-belts cannot be applied or can be put on only at considerable expense and trouble in taking a machine down to get at the sheaves. This belting comes in 50-ft. lengths, in widths of 21/32nd inches, ⅞ in. and 1¼ in. and in thicknesses of $\frac{7}{16}$ in., ½ in. and ¾ in. The angle of the sides of the "V" in each case is 40 deg. Metal fasteners are used with this belt.

## Electric Hoist

A NEW ELECTRIC WIRE ROPE HOIST of low-cost has been announced by Harnischfeger Corporation, Milwaukee, Wis. Known as the "P & H Zip-Lift" this hoist has been designed for flexible handling service in all types of industry. It is light enough for a man to carry and can be mounted rigidly or on a hook or trolley, and can have interchangeable mountings when so desired. It operates with pushbuttons and is powered from an ordinary lighting circuit.

The new hoist is available in capacities of 250, 500, 1,000 and 2,000 lb.

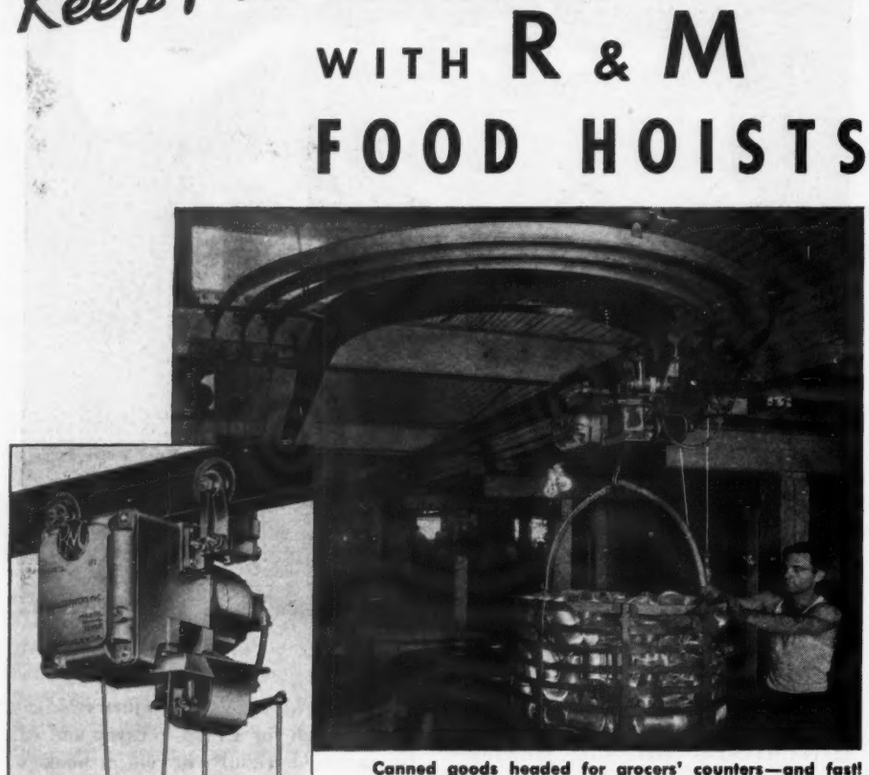
## Totally Inclosed Motors

CENTURY ELECTRIC CO., St. Louis, Mo., has brought out a new design of totally inclosed fan-cooled squirrel-cage induction motors. These motors are suitable for the food field, particularly for those installations where there are abnormal quantities of dust in the atmosphere, which would injure or clog the windings of a general purpose open motor. Within the motor, a non-sparking fan is located

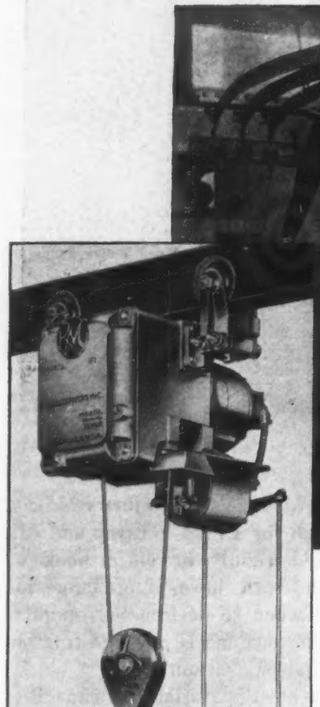
Totally inclosed fan-cooled motor.

# *Keep Production at Peak*

## WITH R & M FOOD HOISTS



Canned goods headed for grocers' counters—and fast! Note low headroom and wide operating range of this special R & M canner's electric hoist, handling peak production without a whimper, for a leading food plant.



This R & M electric canner's hoist takes overload production in easy stride. Capacity is 1,000 lbs. and hoisting speed 32 feet per minute with standard lift of 20 feet. Oil bath enclosure prevents drippings and easy-moving ball bearing trolleys provide swivel action for curved I-beam track. Note special, time-saving canner's hook.

WITH production pressure on, as it is these days, every wasted minute in handling operations means drastic losses. Step up your output, keep handling costs down to a minimum with powerful, speedy R & M electric hoists.

You can choose from 2,000 stock models—all built to quality standards, designed to deliver maximum lift in minimum headroom space. Or if your setup is decidedly unusual, R & M food plant specialists will quickly build the *right* hoist to fit the job.

It will pay you to "take it up" with R & M. Consult the nearest R & M sales and service office listed in your telephone directory or the following canning machinery manufacturers who handle R & M hoists:

A. K. Robins & Co. . . . . Baltimore
Berlin Chapman Co. . . . . Berlin, Wis.
Chisholm-Ryder Co. . . . . Niagara Falls
Sprague-Sells Corp. . . . . Hoopeston, Ill.
F. H. Langsenkamp Co. . . . . Indianapolis
Dunkley Co. . . . . Kalamazoo, Mich.

*Write for descriptive literature to*

**ROBBINS & MYERS, Inc.**
HOIST & CRANE DIVISION • SPRINGFIELD, OHIO
MOTORS • FANS • MOYNO PUMPS • FOUNDED 1878


to force a generous quantity of cooling air through the passages. This is said to give a cooler motor with cleaner air passages. The air intake is designed so that it is not easily clogged and so that a 5-16 in. diameter rod will not pass through.

## Bearing Lubricant

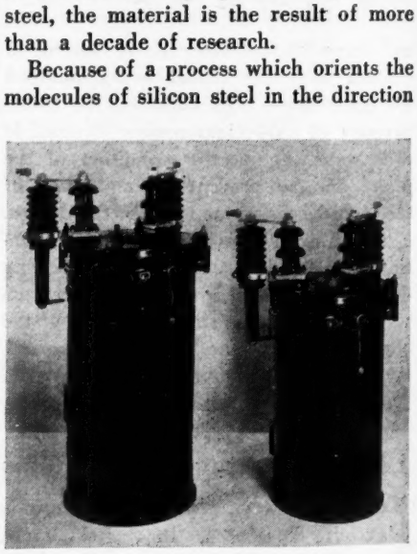
GULF OIL CORPORATION—GULF REFINING Co., Gulf Building, Pittsburgh, Pa., is making two new lines of lubricating greases for ball and roller bearings.

One of these lubricants, called "Gulf Anti-Friction Grease" is recommended for heavy duty service. The other, called "Gulf Precision Grease" is recommended for lighter duty and higher speeds. Both of these lubricants have a high melting point and have been prepared for greatest resistance to oxidation and separation. They are both available in a wide range of consistency.

## Improved Transformers

SMALLER and lighter transformers with better electrical characteristics and capacity for greater overload are now being made by Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. These improvements are made possible by the development of a better magnetic material for the transformer core. Called "Hipersil", short for high permeability silicon steel, the material is the result of more than a decade of research.

Because of a process which orients the molecules of silicon steel in the direction



The "Hipersil" distribution transformer (right) is as much as 25 percent smaller and lighter than the conventional unit (left).

of rolling, the material is easily magnetized in this direction and has one-third greater flux carrying capacity than the best conventional silicon steel, according to the manufacturer. Therefore, smaller cores and fewer turns of copper can be used in the transformer, together with

less oil, giving a weight reduction of 20 to 25 percent.

Maintenance of the transformers with the new type of core is easier, because the core is assembled in two pieces that can be taken apart easily for replacement of coils. In the older type of transformer cores, replacement could only be made by taking them apart, lamination by lamination.

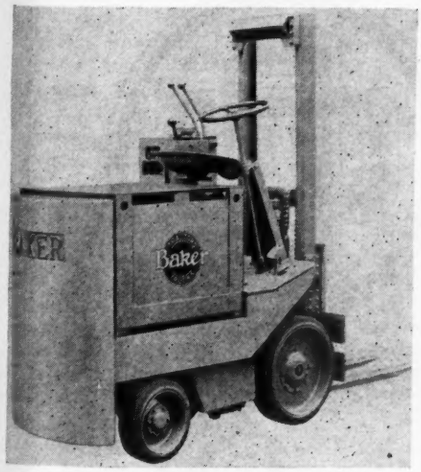
Transformer hum is also said to be less with the new core material, as it has less magnetostriction—elongation—under the influence of the magnetic flux.

Outdoor distribution transformers made with "Hipersil" have been announced by Westinghouse in sizes ranging from 1½ to 500 kva. for voltages of 2,400, 4,800 and 7,200.

## Center Control Fork Truck

BAKER INDUSTRIAL TRUCK DIV., Baker-Raulang Co., Cleveland, Ohio, is making the Type JOM center control fork truck in two models, of 2,000 and 3,000 lb. capacity, respectively. These trucks have been designed for operation in narrow aisles and congested areas. The design is compact and combined with a short turning axle, making it particularly adapted for working in close quarters. With the operator riding in the center of the truck, he has the benefit of good vision of his work at all times. All controls are conveniently grouped on a panel at the operator's left. Control of hoisting and tilting of the fork are provided through a hydraulic system, in which a motor-driven gear pump supplies oil under pressure to the hoisting and tilting cylinders through metering valves, the excess being bypassed through unloading valves to the oil reservoir. Lowering is accomplished by gravity.

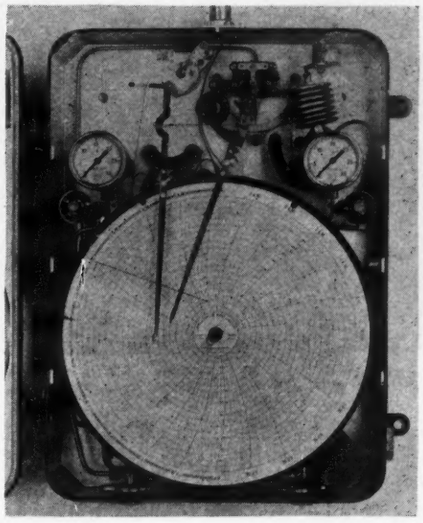
The 2,000-lb. capacity truck is furnished to handle loads up to 60 in. in length and the 3,000 lb. model for loads up to 42 in. in length. The standard simple lift is 72 in., and 109 in. of lift is provided by a telescopic arrangement.




Compact model of center control fork lift truck

## Control Instruments

BRISTOL CO., Waterbury, Conn., has brought out a new throttling type air-operated temperature controller, known as the Pre-Set Free-Vane temperature controller. This has been developed for use in processes where the thermal characteristics are such that there is a tendency for the temperature to exceed the control setting of the instrument on the initial rise. For instance, many processes, particularly batch processes that are started up and shut down at frequent intervals, have heating characteristics which cause over-shooting of the control point on the starting up cycle. This is due primarily to the slow rate of circulation and resistance to heat transfer. An example of this type of process is the jacketed-cooling unit where the jacket has appreciable mass and requires considerable cooling medium to arrive at the desired temperature.

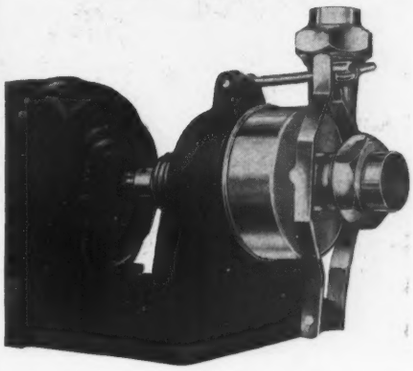


Temperature controller for heating and cooling processes

For this type of process, the new controller introduces a pre-setting effect that is proportional to the width of the throttling range and also to the rate of change of the condition being measured and controlled. The controller action occurs prior to or during the approach of the pen to the control point. It tends to decrease the rate of change of position of the pen and permits the controlled temperature to gradually approach the controlled point.

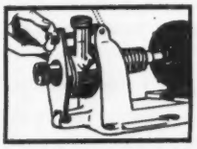
With this instrument the magnitude and duration of the pre-setting effect may be adjusted over a wide range by adjustment of a pointer on a calibrated dial.

WRIGHT QUICK-CLEANING STAINLESS STEEL PUMPS

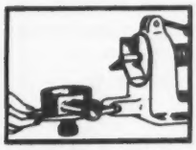


Outstanding features and advantages that provide most effective pumping of liquids make Wright *Stainless Steel* Pumps highly successful for a wide variety of applications in the food industries.

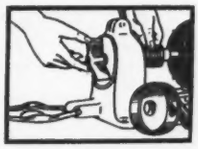
These time-tested and proved *stainless steel* pumps are extremely sanitary, durable and efficient. They reduce operating and maintenance cost and are quickly taken apart for cleaning in 5 seconds.



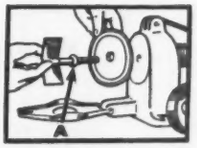
1 Twist wing nut holding clamp and swing locking nut out of way.



2 Lower clamp and body ... which is then easily removed.



3 Turn impeller backward to unscrew shaft from spring coupling.




4 Remove impeller with shaft, and face plate. Slip seal ring "A" from shaft.

R. G. WRIGHT COMPANY, INC.
2934 MAIN ST., BUFFALO, N. Y.

GET THESE FACTS

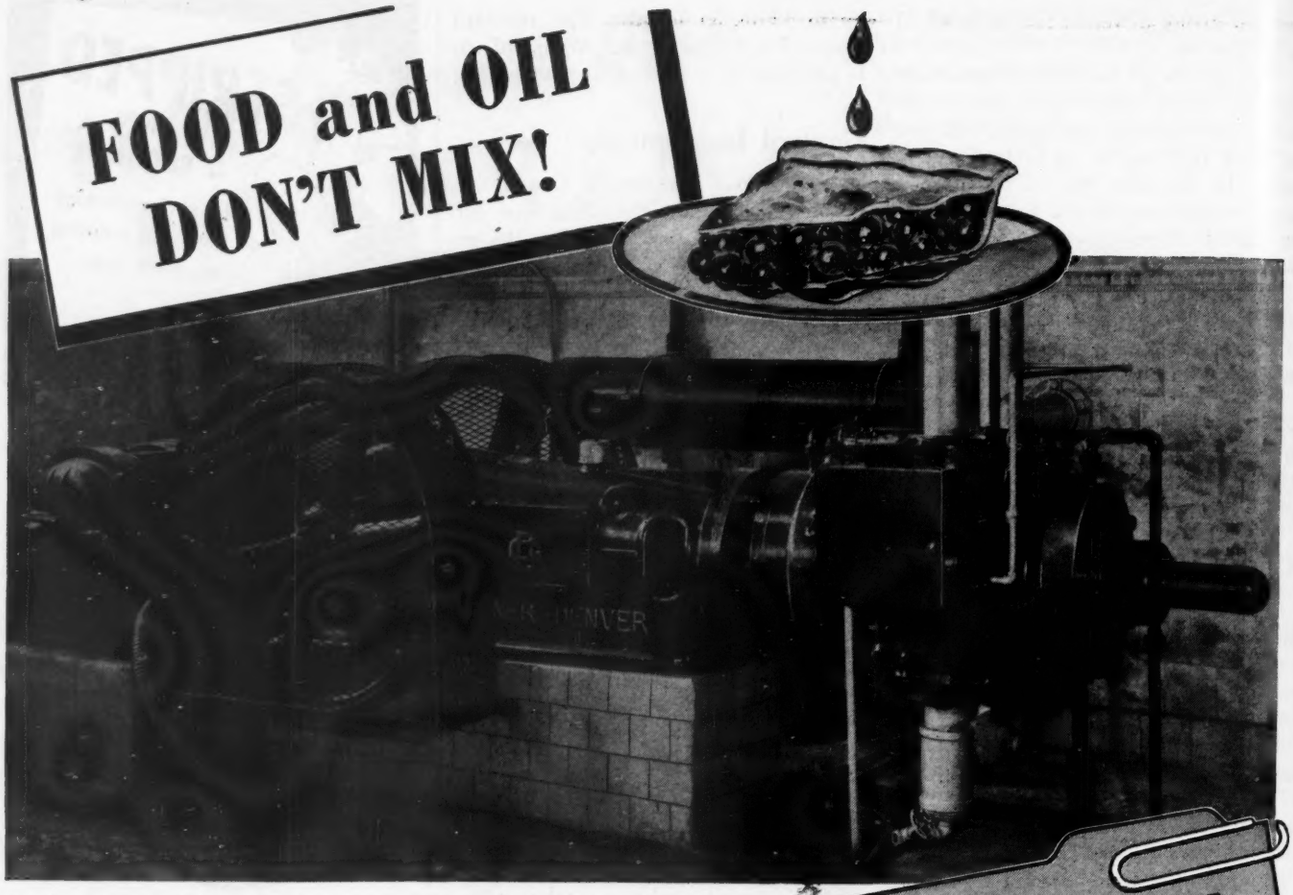
Please send your catalog on Wright *Stainless Steel* Sanitary Pumps.

Name_____

Address_____

City and State_____

# FOOD and OIL DON'T MIX!



*Gardner-Denver Carbon Ring Compressors are built in sizes from 89 to 1292 cubic feet displacement per minute.*

**A TYPICAL USER REPORT:**

**"Our Gardner-Denver "CRX" Carbon Ring Compressor operates 24 hours a day in counter pressure service and is used in other service about the plant. The rings and bushings have been in use for over 2000 hours, and will not be checked for wear for another 1000 hours."**

FOOD manufacturers know that just a few drops of oil could taint an entire batch of their product. Because you can't mix food and oil, you need an oil-free air supply in your food processing plant. That's why Gardner-Denver Carbon Ring Compressors are built with these oil-free features:

- Weight of piston is carried by piston rod and tail rod. No metallic contact between piston and piston bore. Carbon rings only bear on cylinder walls—require no lubricant—no oil, water or glycerine in the cylinder bore.
- Solid carbon bearing rings provide additional support in the stuffing boxes.
- Special distance piece between cylinder and frame prevents entrance, into cylinder, of that part of piston rod working in power end. Special collar on piston rod prevents any trace of oil entering cylinder stuffing box.
- Special metallic wiper prevents oil being carried along the piston rod from the crankcase.

In addition, the Gardner-Denver "CRX" Compressor is equipped with Electro-Pneumatic control which automatically fits air output to air needs—and Gardner-Denver "air-cushioned" Duo-Plate Valves that are light, efficient, and durable.

For low h.p. requirements per cubic foot of pure, oil-free air delivered, choose the Gardner-Denver "CRX" Carbon Ring Compressor. Write Gardner-Denver Company, Quincy, Ill.

GARDNER-DENVER

*Since 1859*

# Just off the Press

## BOOKLETS · LITERATURE · BULLETINS

### *Food Plant Equipment*

**Air Conditioning**
In a 16-page bulletin, a complete index to air conditioning, refrigeration and space heating equipment, and to related services, is presented by Carrier Corporation, Syracuse, N. Y.

**Canning Equipment**
A complete line of modern canning machinery and supplies for all types of fruits, vegetable and other canning plants, is described with illustrations and application data in the 1941 General Catalog, No. 600, issued by Food Machinery Corp., Sprague-Sells Div., Hoopeston, Ill.

**Electric Hoist**
In Bulletin No. 29, "ElectroLift" a worm drive noiseless electric hoist for monorail hoist application is described and illustrated by ElectroLift, Inc., 30 Church St., New York.

**Filter Systems**
"Master-Aid" filter systems for use with wines, fruit juices and other food liquids are described with specifications in a 12-page illustrated bulletin of Chas. S. Jacobowitz Corp., 1432 Niagara St., Buffalo, N. Y.

**Materials Handling Equiment**
An overhead monorail conveyor with cabs that can be raised and lowered so that cab operator can handle loads without a helper, is the subject of a 4-page illustrated bulletin, Form 2006-A, of Cleveland Crane & Engineering Co., Wickliffe, Ohio.

**Mixing Equipment**
Various types of portable and stationary mixing equipment, ranging in size from 1/1000th hp. to 25 hp., are described and illustrated in a 24-page catalog issued by Eastern Engineering Co., 45 Fox St., New Haven, Conn.

**Proportioning Pumps**
In Catalog No. P-40, a number of different types and sizes of proportioning pumps for the feeding of various types of liquids in industrial plants, pilot plants and laboratories are described and illustrated, with specifications by Hills-McCanna Co., 2349 Nelson St., Chicago, Ill.

**Quick-Freezing Equipment**
Ammonia booster systems, used in connection with the refrigeration demands of plants that are quick-freezing foods, are described with specifications and application illustrations in 16-page Bulletin No. 516-B of Frick Co., Waynesboro, Pa.

**Refrigeration Equipment**
The use of "Caterpillar" diesel engines for operating refrigeration equipment in food plants is briefly described with illustrations in Form No. 6578 of Caterpillar Tractor Co., Peoria, Ill.

**Unit Coolers**
"Controlled Cooling" is the title of a 4-page publication explaining the operation of a new wall-type cold Diffuser designed for cooling storage spaces, published by Carrier Corp., Syracuse, N. Y.

**Vibrating Conveyor**
The "Ajax Lo-Veyor" for bulk materials, a vibrating conveyor in capacities up to 270 tons per hour, is described with specifications in Bulletin No. 31 of Ajax Flexible Coupling Co., Westfield, N. Y.

### *Plant Supplies*

**Air Filters**
"Air-Maze" air filters for removing dirt, dust and other foreign matter from air used in ventilating and air conditioning systems, coolers and other industrial equipment are fully described and illustrated, with application information, in 18-page bulletin GPC-740, issued by Air-Maze Corp., 5200 Harvard Ave., Cleveland, Ohio.

**Bearing Units**
A new series of anti-friction bearing units in five types from light to heavy duty are the subject of 88-page illustrated data book No. 1775, published by Link-Belt Co., 307 N. Michigan Ave., Chicago, Ill.

**Cold Plates**
"Doleco" vacuum cold plates for use in the refrigeration of cold rooms such as ice cream hardening rooms, and for refrigerated trucks, among other uses, are described with specifications in Catalog No. 21 published by Dole Refrigerating Co., 5910 North Pulaski Road, Chicago.

**Precision Switches**
Complete engineering data on precision snap-action switches, including dimensions, prices, operating characteristics and information as to applications, are given in a 36-page illustrated catalog released by Micro Switch Corp., Freeport, Ill.

**Pumps**
A new catalog of industrial pumps containing bulletins of centrifugal pumps, reciprocating pumps, rotary pumps, sump pumps and other accessory and associated equipment has been issued by Goulds Pumps, Inc., Seneca Falls, N. Y.

**Tank Support**
"Simplex" jacks for supporting and leveling both horizontal and vertical tanks are described with specifications and illustrations in an 8-page bulletin, Form Tank-41, issued by Templeton, Kenly & Co., 1020 South Central Ave., Chicago.

### *Packaging*

**Package Checking Chart**
A checking chart for use in checking the design factors in a package to determine the existence of a need for redesign, has been issued by Sutherland Paper Co., Kalamazoo, Mich.

**Packages**
On the occasion of its 50th anniversary, an elaborate 32-page illustrated booklet describing the history, organization and operation of the company, has been issued by National Folding Box Co., New Haven, Conn.

**Wrapping Machinery**
The S&S Transwrap Machine is described and illustrated, and some of the packages made on it are shown, in a recent folder put out by Stokes & Smith Co., Summerdale Ave. & Roosevelt Blvd., Philadelphia.

### *Control Equipment*

**pH Control**
An automatic controller for pH in the liming of raw cane juice is described in a bulletin published by Bristol Co., Waterbury, Conn.

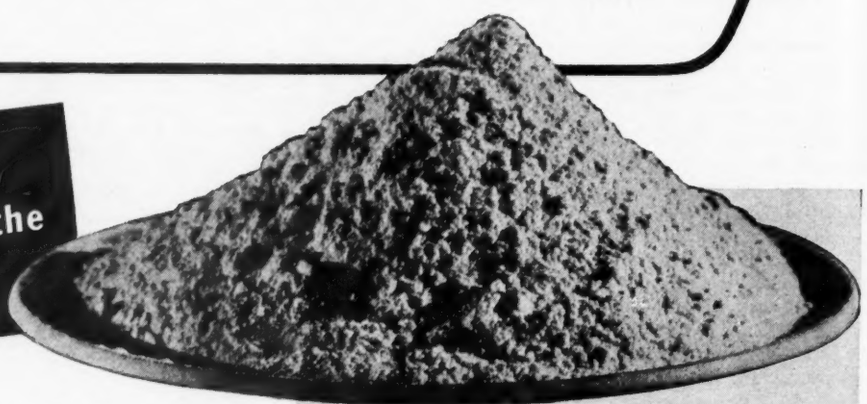
**Milk Plant Control**
In Bulletin No. 550, recording and controlling instruments for use in dairies, including temperature and flow controllers and recorders, also flow diversion valves and glass stem thermometers, are described by Bristol Co., Waterbury, Conn.

### *Laboratory Equipment*

**Electron Microscope**
The RCA electron microscope for obtaining the magnification of images far beyond the powers of the familiar optical microscope is described in an illustrated bulletin issued by Electronic Research Laboratories, RCA Mfg. Co., Camden, N. J.

# *NOW!*... A More Economical Source of Riboflavin (Vitamin G)

**Also contains other members of the Vitamin B Complex**



Solvamin is a rich, natural source of riboflavin synthesized biochemically by a new process developed by Commercial Solvents.

Since its discovery a few years ago, riboflavin (Vitamin $B_2$ or G) has assumed a rapidly increasing importance in human nutrition. Now, Commercial Solvents has developed a new process for the biochemical production of riboflavin. This process makes it possible to furnish practically unlimited quantities of riboflavin at a cost that permits its widespread use.

The new product, sold under the trade name of Solvamin, is a rich source of riboflavin—containing over 4500 micrograms of the vitamin per gram. In addition, Solvamin contains important amounts of other members of the Vitamin B complex, particularly pantothenic acid.

Solvamin is finding widespread use in the restoration of riboflavin to flour and in the addition of this vitamin to cereals and other foods. Have you considered the possibilities of Solvamin in *your* products?

*A request on your letterhead will bring a sample and detailed information*

COMMERCIAL SOLVENTS *Corporation*

17 EAST 42nd STREET, NEW YORK, N. Y.

# SOLVAMIN

## *Rich in Riboflavin*

# Food Technology

## NEW DISCOVERIES & INVENTIONS

## BAKING

### *Value of Ascorbic Acid In Baking*

BECAUSE GRAPEFRUIT JUICE is being considered for bread formulas, as a source of vitamin C and perhaps as a dough conditioner, a study has been made of grapefruit juice bread. Vitamin C (ascorbic acid) is very sensitive to oxidation. And tests indicate that, when it is added to dough either in grapefruit juice or as the pure crystalline vitamin, it is oxidized during mixing and baking so that the ascorbic acid content of the baked bread is negligible. In cake, on the other hand, about half of the ascorbic acid in added grapefruit juice was retained in the freshly baked cake and about a fourth was still present 48 hours after baking. Tests of levo-ascorbic acid as a dough conditioner show that it is as effective as bromate, on a weight-for-weight basis. The isomeric compound, dextro-ascorbic acid, has no value as a dough conditioner.

Grapefruit juice as a source of levo-ascorbic acid for dough conditioning is not to be recommended because the acidity introduced by the necessary volume of juice impairs the volume and texture of the baked bread. Its use as a dough conditioner is not barred entirely by this consideration, but is limited to small additions of the juice.

Digest from "Value of Ascorbic Acid From Various Sources in Baking," by J. F. Feaster and W. H. Cathcart, *Cereal Chemistry* **18**, 201, 1941.

### *Moisture Determination In Flour and Biscuit*

DETERMINATION of moisture content in powders by measuring the dielectric constant is applicable to many materials, but variations in packing density and other factors necessitate preliminary experiments for each type of powder. In particular, the constant *n* in Lichtenecker's law of mixtures is different for different powders and needs to be ascertained. The Lichtenecker law, in the latest adaptation of dielectric measurements to moisture determination, is made the basis for mathematically leveling the packing density of the powder. This is important to accuracy because packing density is an influential factor with respect to dielectric constant.

Tests with ground biscuit have led to a satisfactory procedure for determining moisture content, and the influence of such factors as salt content, temperature and electrical conductivity have been investigated. Moisture determinations were also made in granulated sugar and in specimens of wheat flour (35 percent and 85 percent). The condenser which gave good results with ground biscuit was not suitable either for sugar or for flour. Since a condenser which serves well for one powder is likely to be unsuitable for another, a method of transition has been developed for passing from one condenser to another without lengthy calibration.

Digest from "Use of Dielectric Measurements to Determine the Moisture Content of Powdery Substances, II," by V. B. Yevstigneyev, *Cereal Chemistry* **18**, 137, 1941.

## DAIRY PRODUCTS

### *How Vitamins $B_2$ and C Affect Flavor of Dairy Products*

VITAMIN INFLUENCE in foods is not limited to their nutritional functions. Search for the sources of "papery" and "cappy" or metallic off-flavors in milk, cream, butter and ice cream has revealed a close relation between these flavor defects and the richness of the milk in riboflavin and vitamin C. The immediate cause of the off-flavors is dissolved oxygen. Vitamin C (ascorbic acid) is an antioxidant, and as such it helps to protect milk and milk products from "oxidized" flavors. Fresh milk averages about 22 mg. of vitamin C per liter and, in the absence of dissolved oxygen, this vitamin is stable to heat, light, enzymes and any traces of copper which may have been taken up by the milk. But, in the presence of dissolved oxygen, all these influences favor destruction of the vitamin by oxidation to dehydroascorbic acid. Under ordinary conditions milk flavor can be protected by fortifying the milk with 50 to 100 p.p.m. of vitamin C.

Riboflavin enters the picture as a catalyst of the photochemical oxidation of ascorbic acid. Milk contains on the average about 2 mg. of riboflavin per liter. This amount suffices to accelerate the destruction of vitamin C if milk containing dissolved oxygen is exposed to sunlight. Light also tends to inactivate the riboflavin, which is needed for its nutritional effects. Hence, milk, if not deaerated should be protected from undue exposure to light.

Digest from "Riboflavin, Vitamin C and Flavor of Dairy Products," by Paul F. Sharp and David B. Hand, *Proceedings of the First Food Conference*, Institute of Food Technologists, 139, 1940.

### *Avoiding Bitter Milk*

MILK as drawn from the cow contains an enzyme, lipase, which acts on the fat, producing a bitter flavor. This is not troublesome when the cows are on grass feed, but in wintertime stall-fed cows, particularly those near to drying up, give milk of this type. If such milk is held warm (90 to 98 deg. F.) for one to three hours immediately after milking, such milk shows much less tendency to become bitter. A milk, which on cooling became bitter in 12 hours, when held at 92½ deg. F. for 2½ hours before cooling became bitter only after 42 hours. Cooling the milk immediately after milking to 60 to 68 deg. F. or below increases the development of bitterness. Milk once cooled, then rewarmed, becomes bitter even more rapidly. These facts are entirely apart from the growth of bacteria and the development of acid, both of which decrease rancidity.

(From these results the danger of the farmer mixing warm morning's milk with cooled night's milk before delivery is apparent. In the New York milk shed, where morning's milk can be delivered uncooled up to 9 a.m., the morning milk should be less liable to bitterness than the cooled night's milk. This is an argument in favor of twice-a-day delivery, as practiced in some parts of the South. However, boards of health probably won't approve of farmers holding freshly drawn

milk warm for some time before cooling —Abs.)

Digest from "Inhibition of Lipase Activity in Raw Milk," by N. P. Tarassuk and G. A. Richardson, *Science* **93**, 310, 1941.

## VITAMINS

### *Effect of Processing On Vitamin A*

THE CAROTENE (vitamin A) content of green leafy vegetables does not suffer from ordinary processes of handling for market if the produce is protected from the dessicating and wilting effects of summer heat and from exposure to rain. Drying, storage, freezing and sterilizing or pasteurizing are processes which need attention in this respect. Cool moist storage conserves vitamin A and the storage loss in quick frozen vegetables is negligibly small.

Both carotene and its conversion product, the true vitamin A, are relatively stable to the temperatures ordinarily encountered in freezing, cooking and canning, so that losses from these causes are ordinarily only slight. But vitamin A is very sensitive to oxidation, and when exposed to oxidizing conditions it is also temperature-sensitive since heat accelerates oxidation. Sun drying is especially destructive to carotene or vitamin A, and there is some loss even in the most carefully controlled drying operations. Vacuum drying is helpful and the vitamin loss can be kept low, though it is not entirely eliminated. Storage results in gradual loss—the higher the temperature the faster the loss. Irradiation of milk (to increase vitamin D potency) does not impair vitamin A potency; neither does pasteurization. Ethylene treatment of fruits and vegetables is also apparently harmless to vitamin A.

Digest from "Effect of Processing on the Vitamin A (Carotene) Content of Foods," by C. R. Fellers, *Proceedings of the First Food Conference*, Institute of Food Technologists, 97, 1940.

### *Effect of Processing On Vitamin $B_1$*

HYPOVITAMINOSIS $B_1$ (thiamine deficiency) is pandemic in the United States, largely because the popular demand for white flour led to roller milling of wheat, a process which in one stroke cut the thiamine intake of the average American diet approximately in half. Cereal foods other than flour have also been poor in thiamine, hence low in vitamin $B_1$ potency, either because of losses in refinement or because toasting destroyed the thiamine. Either milling methods should be modified, as some mills are now doing, or refined cereal products should be fortified with synthetic thiamine. The present cost is about 34 cents a barrel for enriching white flour with synthetic thiamine. The advantage is that color and flavor are not altered.

A pint of fresh milk supplies about a tenth of the daily thiamine requirement. Heating destroys thiamine, but modern drying in making milk powder is so rapid that the loss is small. Test results for other treatments vary considerably, but in general it may be said that thiamine losses range up to about 20 percent in pasteurization, over 40 percent in condensation and nearly 50 percent in evaporation. Thiamine loss in ordinary kitchen cooking of vegetables may be about 20 per cent, and much more if soda is added to the cooking water. Discarding the cooking water wastes both vitamins and minerals. The loss in roasting meats is high, probably about 40 percent, while in frying there is less loss because exposure time is much shorter. Canning causes about as much loss as kitchen cooking. Juices should not be discarded. There is no appreciable loss of thiamine in frozen foods.

Digest from "Effect of Processing on the Vitamin $B_1$ Content of Foods," by R. S. Harris, B. E. Proctor, Samuel Goldblith and Julius Brody, *Proceedings of the First Food Conference*, Institute of Food Technologists. 109, 1940.

### *Rancidity in Flaked Cereals*

A RANCID ODOR is sometimes encountered when a package of flaked cereals is opened. Wheat flakes are especially susceptible to rancidity, and moistureproof package liners have aggravated the tendency. The reason is that these liners, while serving their dual function of retaining natural moisture and excluding excess atmospheric humidity, also retain within the package the organic vapors which cause the rancid odor.

Chemical stability tests showed wheat-bran oil to be so stable that rancidity can hardly be induced even under the severest conditions, whereas wheat-germ oil is among the most unstable of the cereal oils. Enrichment with 2 percent of bran oil gave no improvement in wheat flakes, presumably because there is already sufficient bran oil to exert its full protective effect. Cooked grits (prior to flaking, but dried to the usual moisture content of flakes) are far more stable than wheat flakes. This is because the flaking process extrudes oil from the oil cells and spreads it over the flakes, exposing a large surface of oil to air. Cooking the grits in dilute salt brine also increases the sensitivity of wheat-germ oil to rancidity development.

Tests with natural and synthetic antioxygens (lecithin, oat flour, ascorbic acid derivatives, glucamine, methyl salicylate) as stabilizers of wheat-germ oil show that the problem is entirely different from the rancidity problem in lard or salad oil. Some improvement can be gained with antioxygens, but they are in general far less effective in wheat flakes than in the edible fats. Research is especially needed in the physical and colloidal aspects of stability in cereal flakes.

Digest from "Rancidity in Flaked Breakfast Cereals," by Lucius W. Elder, Jr., *Oil and Soap* **18**, 38, 1941.

### *Vitamin $B_1$ Assay By Fluorophotometry*

BIOLOGICAL ASSAY METHODS for vitamins are expensive and time-consuming. While animal feeding tests may be essential for providing the final answer concerning the effects and merits of a food factor, chemical or physical tests which will quickly and conveniently supply information so that biological tests can be cut to a minimum will be a help to vitamin research.

Thiamin (vitamin $B_1$) exists in the free state and in a phosphorylated form. Either form is oxidized to thiochrome (free or phosphorylated) by potassium ferricyanide in alkaline solution. This reaction has now been made the basis for a chemical assay of vitamin $B_1$ since


Fuller **STEELGRIPT BRUSHES**

TO manufacturers and processors of Food: Wherever you use Brushes, consider Fuller STEELGRIPT'S enduring construction with its greater density of brush material, securely gripped in rigid, rust resisting metal backings.

Conveying equipment, wrapping and packaging, bottling and labeling machinery operate more efficiently with these sturdy, long wearing Brushes.

*Also try our standard line of Floor Brushes, Dusters and the famous FULLER FIBER Broom.*

The FULLER BRUSH Company
INDUSTRIAL DIVISION — DEPT. BC
3592 MAIN STREET HARTFORD, CONN.

thiochrome can be extracted from the sample with isobutanol, in which it gives a violet-blue fluorescence in ultra-violet light. Phosphorylated thiochrome can be set free by enzyme hydrolysis before extracting with isobutanol so that no vitamin $B_1$ escapes observation. The fluorometric assay, as originally announced by Hennessy and Cerecedo at the Baltimore Meeting of the American Chemical Society in April, 1939, has been simplified in some of its details, especially in using takadiastase to liberate thiochrome from its phosphorylated form. A Pfaltz & Bauer Model A fluorophotometer is used to measure the violet-blue fluorescence of the extracted thiochrome. By using a zeolite to separate thiamin from complex mixtures which would interfere, the method has been made applicable to food products. Yeast, wheat germ, cereal extracts and numerous vitamin preparations have been assayed by the new method.

Digest from "Assay of a Variety of Vitamin $B_1$ Preparations by the Fluorophotometric Method," by J. W. Cole, W. S. Jones and W. G. Christiansen, *Journal of the American Pharmaceutical Association* 29, 434, 1940.

### *Fortifying Milk with Vitamin D*

As a fat-soluble vitamin, the natural vitamin D in milk occurs mainly in the cream and so passes into the cream and butter. Estimates of the actual vitamin content of milk range from 3.1 to 57.4 U.S.P. units per quart, while estimates of the desirable content range from 135 to 400 U.S.P. units per quart. But milk also contains cholesterol, which is convertible into vitamin D. This is the basis for the irradiation treatment which employs ultraviolet irradiation to convert cholesterol to the vitamin. In commercial practice potencies of 135 to 400 U.S.P. units per quart are attained by irradiation, thus giving milk the desired vitamin D potency.

A more expensive method which also gives potencies up to 400 U.S.P. units per quart is to feed irradiated yeast to dairy cows. In small well-managed herds of high-producing cows, this method may be good and acceptable practice, but it is not generally applicable. Still another method of fortifying milk in vitamin D is to add concentrates made from fish liver oils or from irradiated ergosterol, emulsified in milk or a milk product such as evaporated milk. The concentrate is usually added before pasteurization. In general this method is more suitable for batch operations than for continuous flow methods of processing milk.

Digest from "Vitamin D Content of Dairy Products: Methods of Fortifying Milk," by K. G. Weckel, *Proceedings of the First Food Conference*, Institute of Food Technologists, 133, 1940.

### *Effect of Processing On Vitamin C*

Although vitamin C (ascorbic acid) is the most sensitive to destruction among all the recognized essential nutrients, it can be largely conserved by proper control of processes. The first fundamental is protection from oxidation, a reaction to which this vitamin is particularly sensitive. It does not oxidize spontaneously in air in neutral or acid solutions but does so in alkaline solutions. Since most food products are on the safe side in this respect (either neutral or acidic), protection depends almost entirely on avoiding contact with atmospheric oxygen and keeping catalytic substances out of the food product.

The principal naturally occurring catalysts are enzymes. The principal catalyst likely to be introduced during processing is copper from copper apparatus. Hence in drying, storage, blanching, comminuting, freezing, pasteurizing, cooking and canning, the factors to be watched are oxidative enzymes, contamination with copper and exposure to air. Carelessness in cooking or canning may destroy as much as 90 percent of the ascorbic acid in a food, whereas 75 to 90 percent can be retained under proper steaming or boiling conditions, and 40 to 70 percent in baking, roasting or frying. Fermentation and pickling processes involve enzyme action and in general do not permit much retention of vitamin C, but sauerkraut manufacture is an exception to this rule.

Digest from "Effect of Processing on the Vitamin C Content of Foods," by C. G. King and D. K. Tressler, *Proceedings of the First Food Conference*, Institute of Food Technologists, 123, 1940.

## MISCELLANEOUS

### *Dairy Equipment*

One of the outstanding advances in dairy sanitation was the introduction of stainless steel 18–8 for handling products. The latest improvement along this line is adaptation of stainless steel fittings to dairy equipment, especially the new recessless ferrules soldered on stainless steel pipe or expanded in place. The plate heat exchanger is contributing much to sanitary milk handling. It is more efficient than any previous heat exchanger, is more compact and easier to clean as well as more sanitary. Other improvements in dairy sanitation include homogenizers with a new, completely sanitary pressure gage; the new roll-less churn; unit coolers for milk-storage rooms; rotary-seal pumps and continuous freezers for ice cream; and a new feeder which automatically introduces fruit, nuts or the like into a continuous stream of frozen ice cream.

Digest from "Sanitary Principles in Design of Dairy Equipment," by George W. Putnam, *Proceedings of the First Food Conference*, Institute of Food Technologists, 27, 1940.

### *Heat-Resisting Mold In Blueberries*

Mold occurring in enamel-lined cans of blueberries but not in plain cans was of such a character as to suggest a facultative anaerobic organism with comparatively high acid tolerance and heat resistance. Two strains were isolated, one of which formed ascospores while the other formed sclerotia. Heat tests showed that the ascospores were not especially heat-resistant but that the sclerotia still showed growth after 9 minutes at 200 deg. F. This was the sterilization temperature employed in the cannery where the mold was encountered. In spite of this difference in heat resistance both strains gave thermal death-time curves with approximately the same slope. The same mold was found in the soil of the blueberry fields. It was identified as a hitherto undescribed species of *Penicillium*.

Digest from "A Facultatively Anaerobic Mold of Unusual Heat Resistance," by C. C. Williams, E. J. Cameron and O. B. Williams, *Food Research* 6, 69, 1941.


LUSTRACAST
by COOPER

*(Electrolytic Polish)*

**Stainless Steel**
**CASTINGS**
**Fittings • Valves**

***Improve*** **the quality of your stainless products with COOPER "Lustracast" Stainless Steel Castings, Fittings, Valves.**

**The exclusive "Lustracast" process gives COOPER products a brighter, CLEANER, more passive surface which in turn increases the practical utility, life and saleability of your products.**

**Investigate these definitely BETTER Stainless Castings, Fittings, Valves.**

**The COOPER**
**Alloy Foundry Co.**
**Elizabeth, N. J.**

# PFAUDLER NEWS FLASHES

FOOD EDITION

June, 1941 PUBLISHED BY THE PFAUDLER CO., ROCHESTER, N. Y. Vol. 2, No. 9


# PUT VACUUM TO WORK FOR YOU

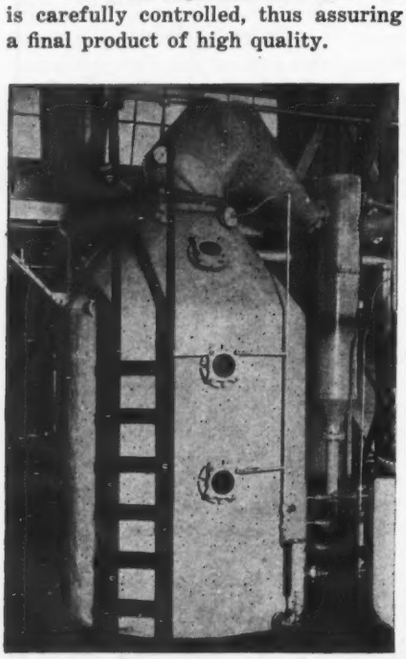
## KEEP PRODUCT NATURAL IN COLOR AND SHAPE SPEED COOKING AND COOLING

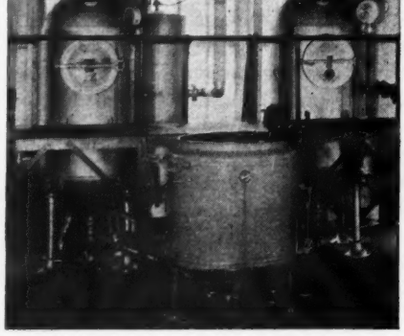
Rochester, N. Y.—Public demand for natural colored and flavored preserved foods—accelerated by the rapid progress of the quick-freezing process—has focused attention of canners and preservers on Pfaudler Vacuum processing.

Pfaudler vacuum pans require no special operating skill and are available in capacities, materials and types to meet your processing needs exactly.

The low cooking temperatures possible with reduced pressure, minimize carmelization—preserve natural color, flavor, shape and vitamin content. Cooking time is shortened for it takes less time for products to reach the lower cooking temperature.

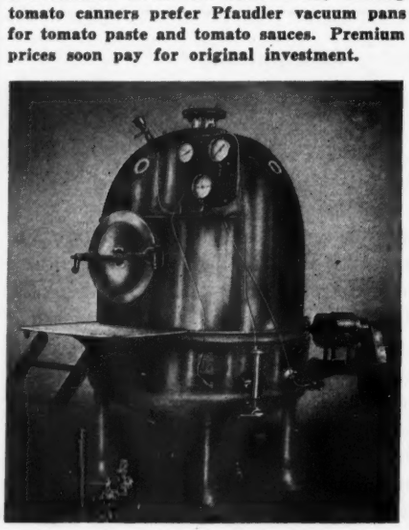
A better product is but one of the many advantages of vacuum operation. Large batches can be processed with minimum supervision. Each cook is carefully controlled, thus assuring a final product of high quality.

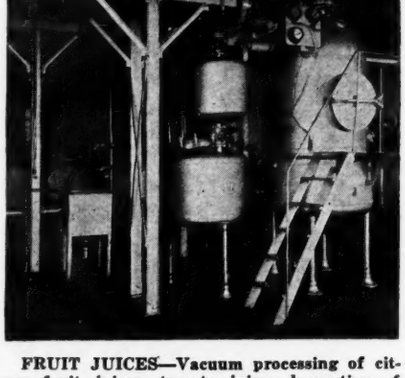




**CONTINUOUS JELLY PROCESS—An excerpt from an issue of Food Industries states —"Vacuum pans speed up jelly production—with no loss of quality. Careful viscosity and pH control permit regulation of pectin and acidity values to take advantage of low temperature evaporation. There is a minimum of destructive action due to oxidation. Jellies of better color and flavor result."**

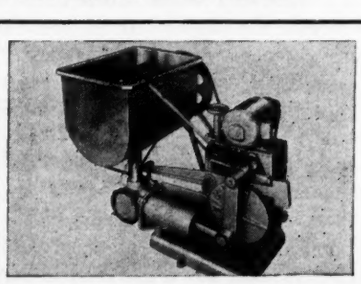
**TOMATO PRODUCTS—Rapid reduction of moisture content plus bright, natural color and realistic flavor are reasons why leading tomato canners prefer Pfaudler vacuum pans for tomato paste and tomato sauces. Premium prices soon pay for original investment.**





**FRUIT JUICES—Vacuum processing of citrus fruit juices, tomato juice, deaeration of apple juice, etc. assures results well worth the cost of vacuum equipment. Also extremely practical for processing baby soups, for regulating moisture content.**

**PRESERVERS MEET STANDARDS — The exactness of control possible with Pfaudler vacuum pans enables preservers to meet rigid preserving standards. If your product contains less than 68% total solids, you violate the law. If you run too far above 68%, costs are needlessly increased by giving too great a quantity of total solids. Either is costly. So, consult our food engineers and save money.**



**Pfaudler-King Piston Fillers Excellent for Orange Marmalade**

Los Angeles, Calif.—The King Kelly Marmalade Co., Bellflower, Calif. recently solved a difficult problem by installing a Pfaudler-King Piston Filler. Long strips of orange peel must stay in suspension with approximately equal amounts going into each container. Prior to the installation of their Pfaudler Piston Filler, the only satisfactory method of filling was by hand with a dipper. Now filling is more rapid and costs have been cut.

If you have a filling problem, Pfaudler-King Fillers may solve them. Let's get together!


**THE PFAUDLER CO.,** *Executive Offices:* Rochester, N. Y. *Factories:* Rochester, N. Y. and Elyria, O. *Branch Offices:* New York, Boston, Philadelphia, Chicago, Cincinnati. Pfaudler Sales Co., San Francisco and Los Angeles. Representatives in principal cities.

# Books

## What's Behind Priorities

PRIORITIES AND DEFENSE. A handbook on the operation of the priorities system. Published by the Office for Emergency Management, new Social Security Bldg., Washington, D. C. 1941. 69 pages; 6x9 in.; paper. Free.

Here is a booklet which will help to clear up any questions in the minds of industrialists regarding priorities policies. It contains a general statement on the theory and administration of the priorities system, a copy of the Priorities Critical List, official instructions on priorities, reproduction of preference rating forms and other material.

## Frozen Fruits, Vegetables

THE FROZEN FOOD INDUSTRY. By Harry Carlton. The University of Tennessee Press, Box 4013, Knoxville, Tenn. 1941. 187 pages; 6x9¼ in.; cloth. Price, $2.

Packed between the covers of this book is a wealth of information on the frozen fruit and vegetable industry—sources of supply, processing methods, markets and distribution policies, with the emphasis on quick freezing. The information was gathered by the author in a ten-month survey in 1937 and 1938, made for the University of Tennessee in the interest of the production of strawberries and other fruits and vegetables in Tennessee. Producing and packing areas and marketing centers were visited and those engaged in the industry interviewed. Attention was also paid to institutional and retail consumers.

*Part I* of the book, on distribution, covers the early history of the frozen food industry, early distribution difficulties, growth of quick frozen food production, new distribution channels for frozen foods, why the acceptance of quick frozen foods is increasing, present extent of institutional and retail distribution, frozen food production, frozen food markets, general sales policies, retail cabinets, holding temperatures in storage and transit, selling prices and losses in distribution of fresh fruits and vegetables.

*Part II*, on production for freezing, has to do with establishing freezing operations, varieties of fruits and vegetables for freezing, present frozen-food packing areas, packing seasons, production of fruits and vegetables which are leaders in the quick frozen food industry, fruit and vegetable yields, prices paid growers and berry-harvesting costs.

*Part III* pertains to processing operations, including general quality control, vitamin content of quick frozen foods, blanching vegetables for quick freezing, grades and standards, modern fruit and vegetable freezing methods, packaging frozen foods, packing costs, packing plant wage rates, preparatory losses in packing fruits and vegetables and comparison of quick freezing and canning costs.

In part IV are chapters on cold storage rates in leading fruit and vegetable packing areas, transportation rates for frozen fruits and vegetables, meeting frozen food competition, quick frozen poultry and freezer-locker plants.

## Dietetic Value of Choline

CHOLINE. Its Physiological Importance. Published by American Lecithin Co., Inc., Elmhurst, N. Y. 1941. 12 pages; 3¾x8¾ in.; paper. Free.

Soybean lecithin as a dietary source of choline is discussed. The information is presented in concise, convenient form, while a list of 44 references is given for those desiring more extensive data. A deficiency in choline is said to cause fatty livers, degeneration of the kidneys and other harmful physiological conditions.

## Study of Starches, Dextrines

STARCHES, DEXTRINES AND RELATED PRODUCTS. Report No. 138, Second Series. Published by U. S. Tariff Commission. 182 pages; 6x9¼ in.; paper. Price, 30 cents; for sale by Superintendent of Documents, Washington, D. C.

Written with special reference to international trade and tariff considerations, this is a survey of the production of starches, dextrines and related products in the principal producing countries, their process of manufacture, uses and distribution.

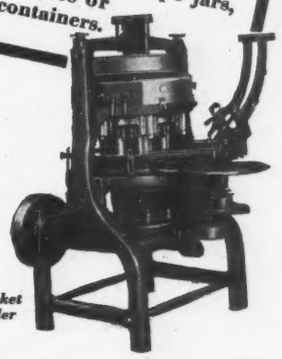
## Cottonseed Fact Picture

COTTONSEED AND ITS PRODUCTS, 1941 Edition. Published by National Cottonseed Products Association, Inc., Memphis, Tenn. 35 pages; 10x7 in.; paper. Free.

The bulletin outlines the development and operation of the cottonseed industry. Included are discussions of value, marketing, processing and research in cottonseed and its products, completed by a statistical picture of production. Of particular interest to the food manufacturer are sections on cottonseed oil and margarine and references to cooking and salad oil and vegetable shortening.


**YOU PREPARE IT... WE'LL FILL IT!**

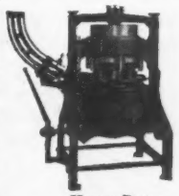
The Sky's the Limit! No matter what the nature of your food products —pulps, liquids, pastes, soups, potted meats, syrups, etc., etc. — there are FMC Fillers designed to fill them *at top speed* with unerring precision into any size or shape jars, cans, bottles or other containers.



*M & S 6-Pocket Plunger Filler*

• This M & S 6-Pocket Plunger Filler, for example, is an extremely versatile machine that handles any liquid or semi-liquid product and fills any size or shape container.

The Heavy Duty Plunger Filler, below, is a positive measuring, plunger type machine built to meet the needs of year 'round canners. Easily adjustable for various size containers, this machine will operate continuously for from 20 to 24 hours a day without interruption.



*Heavy Duty Plunger Filler*

**NO SPOILAGE OR WASTE**

Unless a container is in position under the nozzle, none of the product will be released.

**SPEED**

These 6-Pocket Fillers will fill up to 125 average size containers a minute. Other FMC Fillers are available with capacities up to 250 or more containers per minute.

*Mail the coupon Now for information on the complete line of FMC Fillers!*

**FOOD MACHINERY CORPORATION** F-601-FI
**(Sprague-Sells Division) Hoopeston, Illinois**

Please send complete information on Fillers contained in your New 1941 Catalog.

Product to be handled_____
Sizes and kinds of containers_____
Speed required_____
Name_____
Company_____
Street_____
City_____ State_____

FOR QUICK ROTARY PUMP INFORMATION ... CHECK THESE

VIKING FACTS!

VIKING DATA SHEET

AVAILABLE SIZES:
... 3½, 5, 10, 18, 20, 35, 50, 90, 200, 300, 450, 750, 1050 GPM.

PERFORMANCE:
Will lift liquids up to 20 ft. and deliver against various pressures (in some cases up to several hundred pounds).

TYPE OF LIQUID:
Will pump any clean liquid of heavy or light viscosity.

TYPE AND STYLE:
Standard, Sanitary, Underwriters' Approved, Hydraulic, Bulk Station, Oil Burner, Steam Jacketed, Coolant, Gasoline Dispensing, Fire Truck, Truck Mounting, Heavy Duty, Hand Drive, Marine, Diesel, Oil Field, Butane and many more.

PICK YOUR PUMP
Then Write for Free Bulletin

VIKING
The design that made ROTARY PUMPS famous

VIKING
PUMP COMPANY
CEDAR FALLS, IOWA

# Patents

**Sugar-cane Juices and Sirups Clarified During Passage Through Inverted Frusto-conical-shaped Unit Equipped With Series of Decantation Trays in Vertical Relation To Each Other Inside Outer Casing of Unit**—Armando S. Villasuso, Ingenio Concepcion, Tucuman, Argentina. No. 2,236,202. March 25, 1941.

**Beer Barrel Equipped With Means for Inserting Thermometers Having Threaded Adapter**—Richard T. Cornelius, Minneapolis, Minn. No. 2,236,243. March 25, 1941.

**Flour Bleached and Matured by Action of Powdered Mixture of Benzoyl Peroxide and Potassium Gluconate**—Frederic H. Penn, Dallas, Tex. No. 2,236,322. March 25, 1941.

**Sugar Juices Limed and Carbonated in a Continuous Manner**—Henry A. Benning, Ogden, Utah. No. 2,236,419. March 25, 1941.

**Corn Oil Refined by Centrifuging After Treatment With Alkaline Solution and Application of Heat to Cause Separation of Oil From Fats and Soaps**—George A. Moore, Oak Park, Ill., to Corn Products Refining Co., New York, N. Y. No. 2,236,493. March 25, 1941.

**Chocolate Paste Aerated During Agitation to Expose 2 Square Meters of Surface for Each 100 Kilograms of Chocolate in Treating Unit**—Kurt Wiemer, to J. M. Lehmann, Dresden, Germany. No. 2,236,554. April 1, 1941.

**Shortening Stabilized by Addition of From 0.001 to 0.05 Percent of Lactic Acid**—Donald P. Grettie, Chicago, Ill. No. 2,236,569. April 1, 1941.

**Onion Dehydrated With Retention of Vitamin Content by Browning in Hot Fat Preliminary to Drying**—Bernardo H. Karmen, Los Angeles, Calif. No. 2,236,641. April 1, 1941.

**Glacéd Fruit Made in Unit Which Provides for Controlled Circulation of Sugar Sirup from Fruit to Heat Exchanger and Back to Fruit**—Jesse R. Nell, Los Gatos, Calif. No. 2,236,692. April 1, 1941.

**Fruit Given Identification by Mechanical Marking Means**—Frank Ahlburg and Durbin H. Bradley, to American Fruit Growers, Inc., Los Angeles, Calif. No. 2,236,740. April 1, 1941.

**Egg White Fermentation Preliminary to Drying Speeded up by Oxygen-containing Air to Inhibit Growth of Anaerobic Bacteria**—Norman C. Fischer, Springfield, Mo., to Armour & Co., Chicago, Ill. No. 2,236,773. April 1, 1941.

**Citrus Fruit Residue Ground, Heated With Nontoxic Calcium Salt, Partially Dehydrated and Mixed With Liquid Molasses Preparatory to Drying and Grinding to Powder**—Emory L. Cooke, Atlanta, Ga., and Benjamin H. Ticknor, II., Englewood, N. J., one-half to Commercial Molasses Corp., New York, N. Y., and one-half to Suni-Citrus Products Co., Haines City, Fla., No. 2,236,844. April 1, 1941.

**Bread Dough Improver Made to Have pH of About 5 Through Mixing Urea and Ammonium Propionate**—Herbert H. Bunzell, New York, N. Y. No. 2,236,867. April 1, 1941.

**Juice Extracted From Segments of Citrus Fruits Without Substantial Disruption of Oil Cells in Skin**—Ralph Polk, Sr., Tampa, and Ralph Polk, Jr., Haines City, Fla., to the Polk Development Co., Tampa, Fla. No. 2,236,916. April 1, 1941.

**Egg Whites Acidified to pH Between 5.5 and 5.8 With Heating Between 100 Deg. F. and Below Coagulation Temperature of Eggs Preliminary to Drying**—Verne D. Littlefield, Beverly Hills, Calif., and Norman C. Fisher, Springfield, Mo., to Armour & Co., Chicago, Ill. No. 2,237,087. April 1, 1941.

**Durum Wheat Products Intensified in Color by Treatment With Ammonia Gas While Agitating**—Arno Richard Sasse, Minneapolis, Minn., to Standard Milling Co., New York, N. Y. No. 2,237,090. April 1, 1941.

**Packaged Foods Quick Frozen During Passage Through Refrigerated Inner Guide Tube Surrounded by Refrigerant Tubes Inside an Outer Jacket**—William J. Finnegan, Los Angeles, Calif. No. 2,237,255. April 1, 1941.

**Foods Quick Frozen While Being Conveyed on Endless Belt Through Tunnel Designed to Give Multistage Fluid Cooling and to Produce Refrigerating Conditions**—William J. Finnegan, Los Angeles, Calif. No. 2,237,256. April 1, 1941.

**Food Refrigerated and Later Frozen During Passage Through Unit Designed to Obtain Heat Exchange in Zoned Areas by Convection Currents of Refrigerated Air**—William J. Finnegan, Los Angeles, Calif. No. 2,237,257. April 1, 1941.

**Fresh Meat Cuts Prepared for Packaging in Transparent-cellulosic Wrapper by Covering Outer Surface With Brine-moistened Cloth**—Beverly E. Williams and Leon L. Cadwell, to Industrial Patents Corp., Chicago, Ill., No. 2,237,277. April 1, 1941.

**Nut Shells Given Metallized Coating Before Cracking to Aid in Removal of Shell Particles From Nut Meats**—Donald B. Macfarlane, Berkeley, Calif. No. 2,237,442. April 8, 1941.

**Oxygen-containing Air Removed From Head Space in Carbonated Beverage Bottle by Sweeping Action of Gas Liberated From Beverage by Jarring Action — Charles** Schmutzer, Irvington, N. J., to Hoffman Beverage Co., Newark, N. J. No. 2,237,637. April 8, 1941.

**Food Products Heat-sterilized in Bulk Preparatory to Canning in Sterile Containers**—Charles L. Jones, Chicago, Ill., to Continental Can Co., Inc., New York, N. Y. No. 2,237,739. April 8, 1941.

**Egg White Insolubles, Produced During Acidifying, Dispersed Throughout Mass by Whirling Movement Preliminary to Transfer of Egg Whites to Dryer**—Norman C. Fischer, Springfield, Mo., to Armour & Co., Chicago, Ill. No. 2,237,827. April 1, 1941.

**Maple Flavoring Prepared From Ground Maple Wood**—Clayton J. Ellis, Middlebury, and Ambrose H. Donaldson, Burlington, Vt., to Ambrose H. Donaldson, No. 2,237,981. April 8, 1941.

**Vitamin Containing Oil Obtained from Fish Tissue**—William S. Jones, Brooklyn, N. Y., to E. R. Squibb & Sons, New York, N. Y. No. 2,238,059. April 15, 1941.

**Vegetable Proteins of the Globulin Classification Recovered from Soy Bean Protein**—Percy L. Julian, Oak Park, and Andrew G. Engstrom, Chicago, Ill., to The Glidden Co., Cleveland, Ohio. No. 2,238,329. April 15, 1941.

**Partially Converted Starch Treated With an Oxidizing Chemical to Make Completely Soluble**—Walter A. Nivling, Newton, Mass. No. 2,238,339. April 15, 1941.

**Milk Deodorized During Discharge Into Vacuum Chamber Following Heating Under Pressure for Pasteurization**—Charles E. Rogers, Novi, Mich., to C. E. Rogers Co., Detroit, Mich. No. 2,238,373. April 15, 1941.

**Calf Carcasses Skinned Hot, Covered With a Brine-moistened Cloth, and Encased in Moisture-proof Covering to Retain Bloom During Cooling**—Beverly E. Williams and Andrew S. Hartanov, to Industrial Patents Corp., Chicago, Ill. No. 2,238,546. April 15, 1941.

**Frankfurt Sausages Cooked in Vats Having Hinged Cover Which When Raised Lifts One Side of Sausage Rack**—Joseph William Bierek, Seattle, Wash., to Industrial Patents Corp., Chicago, Ill. No. 2,238,549. April 15, 1941.

**Carbonated Beverage Bottles Dried by Mechanical Means Following Filling, Sealing and Washing**—Bruce G. Copping, Toronto, Ontario, Canada, to The Coca-Cola Co., Wilmington, Del. No. 2,238,554. April 19, 1941.

**Zein Isolated From Corn in Solution and Recovered in Solid Form by Precipitation During Spraying**—Anthony C. Horesi, Downers Grove, Amos H. Flint, Chicago, and Lloyd C. Swallen, Pekin, Ill., to Corn Prod-

ucts Refining Co., New York, N. Y. Nos. 2,238,590 and 2,238,591. April 15, 1941.

**Fish Slit Open and Cleaned by Mechanical Means**—Charles P. Palmer and Arthur L. Palmer, Kilmarnock, Va. No. 2,239,013. April 22, 1941.

**Sucrose Recovered From Sugar-beet Molasses Through Re-use of Calcium Saccharate Sludge**—Roy H. Cottrell and Vernal Jensen, Ogden, Utah. No. 2,239,082. April 22, 1941.

**Powdered Foods Packaged Under Vacuum Without Loss During Application of Vacuum**—Paul E. Pearson, Chicago, Ill., to Continental Can Co., Inc., New York, N. Y. No. 2,239,115. April 22, 1941.

**Lactoflavin Prepared in Crystal Form**—George E. Flanigan and George C. Supplee, Bainbridge, N. Y. No. 2,239,285. April 22, 1941.

**Liquid Foods Sterilized by Passing Through Conduit to Forewarm, Held at Sterilizing Tmperature for Definite Period, and Thereafter Cooled**—Gerald C. North, Evanston, and Virgil C. Stebnitz and Alvin J. Alton, Chicago, Ill., to Beatrice Creamery Co., Chicago, Ill. No. 2,239,397. April 22, 1941.

**Meat Tenderized Mechanically by Knife Action**—Joseph P. Spang, Quincy, Mass., to Cube Steak Machine Co., Inc., Boston, Mass. No. 2,239,430. April 22, 1941.

**Bulk Ice Cream Packaged For Dispensing From Carton in Consumer Portions**—George W. Cooks, Upper Montclair, N. J., to Marathon Paper Mills Co., Rothschild, Wis. Nos. 2,239,482; 2,239,483; and 2,239,484. April 22, 1941.

**Flour and Breakfast Cereals Given Mineral Fortification With Non-Ionizable Metallic Salt of Phytic Acid**—John S. Andrews, St. Paul, and Lacey H. Evans and Louis J. Huber, Minneapolis, Minn., to General Mills, Inc. No. 2,239,543. April 22, 1941.

**Flour Recovered From Endosperm-carrying Husk Portion of Grain Sifted From Flour After Grinding**—Tage Jensen Klint, Munke Molle, Odense, Denmark. No. 2,239,563. April 22, 1941.

**Cereals and Cereal Products Given a Heat or Vacuum Treatment in Vessel Mounted For Rotation upon Trunnions, One of Which is Hollow and May be Connected up With Steam or Vacuum Line**—Erich Gustav Huzenlaub, Brentford, and John Heron Rogers, Elmhurst, Kenley, England. No. 2,239,608. April 22, 1941.

**Food to be Canned Given Steam Treatment in Hopper to Begin Sterilization Prior to Discharge Into Filling Tubes for Sterilizing With Steam in Preparation For Filling Into Sterilized Tins and Sealing of Container**—Charles O. Ball, Oak Park, Ill., to American Can Co., New York, N. Y. No. 2,239,690. April 29, 1941.

**Milk Packaged in Cans Having Upper and Lower Covers With Outward Extending Beads, and Upper Cover Having a Paper Enclosure and Pouring Spout**—Rebecca Becker, New York, N. Y. No. 2,239,691. April 29, 1941.

**Consistncy of Liquid in Semi-liquid Products Measured by Mechanical Means**—William McK. Martin, Maywood, Ill., to American Can Co., New York, N. Y. No. 2,239,726. April 29, 1941.

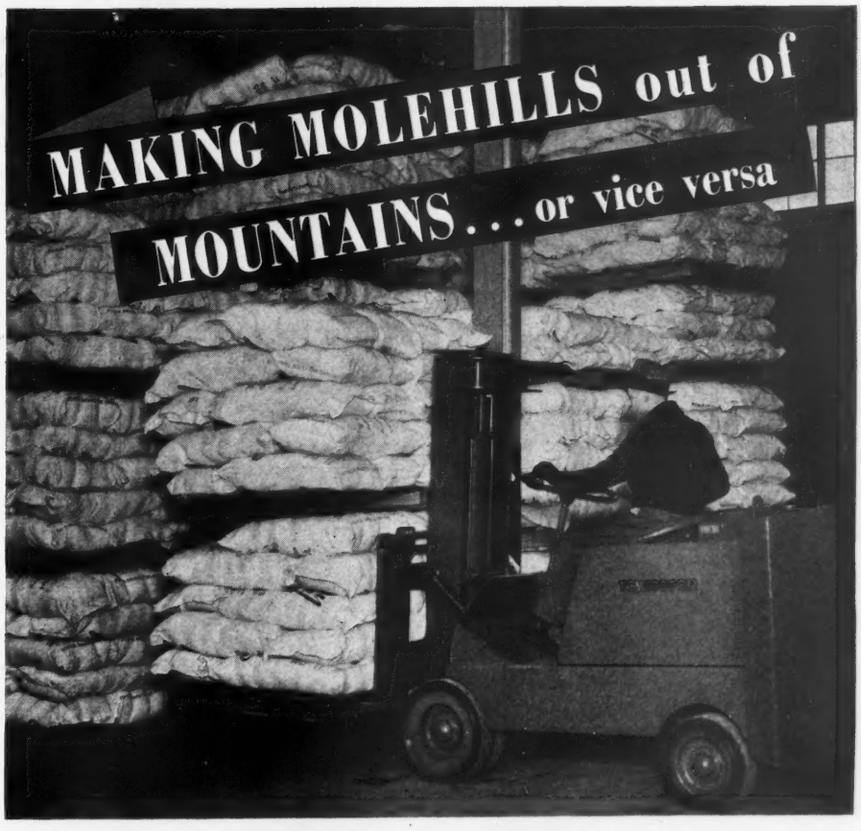
**Gelatin Solution Purified by Passing Through Insoluble Granular Cation Exchange Material at Temperature of 90 to 120 Deg. F.**—Eric Leighton Holmes, London, England, to The Permutit Co., New York, N. Y. No. 2,240,116. April 29, 1941.

### *Canadian Patents*

**Bread Baked in Vertical Oven Equipped With Conveyors Designed to Expose Dough to Initial Baking Heat During Upward Movement And to Final Baking Heat During Downward Movement**—Kenneth E. Bemis, Oakland, Calif., No. 395,056. March 11, 1941.

**Meat Heat-treated in Cooker Equipped With Carrier Having Front and Rear Hinged Grids and Juice Collecting Receptacle**—Kenneth E. Bemis, Oakland, Calif. No. 395,057. March 11, 1941.

**Carnauba-wax Composition Applied to Cooking Grids Permit Repeated Removal of Baked Products Without Sticking**—Kenneth L. Woodman, Mansfield, Ohio, to Canadian Westinghouse, Ltd., Hamilton, Ont. No. 395,137. March 11, 1941.

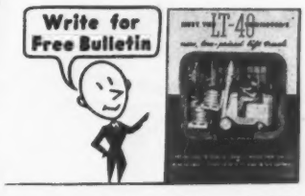

Towmotor

**lifts, hauls, stacks any load from 1,000 to 10,000 lbs.**

Multi-ton loads that would be a task for a crew of men can be handled with ease by *one* man and a Towmotor. Towmotor speeds these loads to any part of your plant *in seconds* . . . stacks them up to 25 feet high. This "unit load" method steps up production . . . by moving materials more efficiently *into, through* and *out* of the plant . . . eliminates *rehandling* in receiving and shipping, increases storage *capacity* without increasing space. All for less than one man's wages. But . . . that's not all.

Towmotor loads and unloads box cars, trucks in *minutes* instead of *hours* . . . speeding up service, lessening risks in perishable goods. By minimizing handling, Towmotor prevents damage to packages, cartons, bags, labels. Pallet stacking keeps goods off floors, keeps plant and warehouse free from congestion. Towmotor hustles about warehouse picking up pallet loads, simplifies assembly of goods for one-load shipping. And, by eliminating heavy lifting and pushing, Towmotor ends injuries to employees.

Towmotor is small, compact and easy to operate . . . even in crowded quarters. Factory experts train your men, help you plan handling efficiently. Learn how Towmotor can make *your* tough handling jobs easy and inexpensive . . . for years to come. Write for bulletin.




TOWMOTOR COMPANY
East 152nd Street
Cleveland, Ohio

Let TOWMOTOR CLEVELAND take the load off your hands

## Cure the Quick Cure

*(Continued from page 67)*

the moisture content in the finished smoked product is complied with, the packer cannot expect to get more than the original green weight. Why, therefore, pump excessive water into the ham only to have this added moisture partially taken out in the smokehouse, thereby necessitating additional heat and smoke, with a resulting higher cost.

The packer who perceives the economic advantage of this appeal cannot fail to realize the importance of utilizing scientific knowledge and experience to guide him in developing a process which is still in its infancy.

## Corn Sirup Solids

(*Continued from page* 70)

### *Effect of Texture On Sweetness Perception*

Throughout the experimental work a relationship seemed to exist between the smoothness of texture and consumer placings as to sweetness of ice creams. In order to determine whether or not the texture of ice cream affected the sweetness perception, batches of ice cream mix were split into two parts. Part of the mix was frozen in a Vogt continuous freezer to obtain a smooth product, while the balance was frozen slowly in a batch freezer to produce coarse texture. Consumer reaction to these ice creams, as is evident from Table VII, indicates clearly that the texture of ice cream affects the sweetness perception. Smooth ice cream identical in composition with a coarse product was considered the sweeter. Table VII also shows that smooth ice cream containing corn sirup solids to replace 26⅔ percent of the sucrose was judged to be sweeter than a coarse ice cream containing sucrose as the sole sweetener.

### *Trials with Ices and Sherbets*

As has already been stated, ices and sherbets were made containing 28 percent sucrose, 21 percent sucrose plus 7 percent dextrose, and 21 percent sucrose plus 7 percent corn sirup solids. The results of these trials are in Table VIII.

From the results given in Table VIII it is evident that corn sirup solids, in combination with sucrose, produce ices and sherbets which are smooth in texture and satisfactory as to flavor. The combination of these sweeteners also eliminates a common defect which occurs in these frozen desserts when sweetened with sucrose alone. This defect is a surface crust of crystallized sucrose. Fig. 2 shows that sucrose crystals do not form on the surface when corn sirup solids or dextrose are used to replace part of the sucrose in ices and sherbets.

**Table VII—Effect of Texture on Sweetness Perception in Ice Cream.***

| Batch No. | Sugar content | Texture | Consumers choice as sweetest, percent |
|---|---|---|---|
| 1 | 15% sucrose | Coarse | 26.3 |
| 2 | 15% sucrose | Smooth | 37.7 |
| 3 | 11% sucrose plus 4% corn sirup solids | Smooth | 36.0 |

* Ice cream batches 1 and 2 were identical in composition. Batch 3 differed only in that it contained the indicated combination of sugars instead of sucrose alone. No. 1 was frozen slowly in a batch freezer so as to get coarse texture; Nos. 2 and 3 were frozen in a continuous freezer and were smooth in texture.

**Table VIII—Effect of Different Sugars on Ices and Sherbets.**

| Sugar content | Percent overrun* | | Consumer opinions: Chosen as Smoothest | | Preferred by | |
|---|---|---|---|---|---|---|
| | Ices | Sherbets | Ices % | Sherbets % | Ices % | Sherbets % |
| 1—28% sucrose | 28 | 33 | 17 | 12 | 27 | 26.5 |
| 2—21% sucrose plus 7% dextrose | 27 | 28 | 26 | 34 | 27 | 26.5 |
| 3—21% sucrose plus 7% corn sirup solids | 33 | 28 | 57 | 54 | 46 | 47 |

* The overrun readings on the ices were obtained after six minutes in a batch freezer, the overrun of the sherbets after eight minutes.

### *General Discussion*

Several investigators have indicated the relative sweetening value of different sweeteners in water solution, and a few have assigned values for some sweeteners in food products. The values assigned to a specific sweetener by different investigators, however, may vary widely. For example, sweetness values given for dextrose vary from 65 to 89, when compared with sucrose as 100. This immediately suggests that the sweetness perception may be affected by factors other than the sugars, factors which have not as yet been considered.

The data accumulated in this study show that the perception of sweetness is affected by the composition of the product and freezing methods. Reference to Table VII clearly shows that the texture of ice cream affects the sweetness perception. The differences in consumer opinions of ice creams containing different sweeteners (Table V) do not show so much variation as those between smooth and coarse ice creams identical in composition (Table VII). When the consumer judgments used in the preparation of Tables III and V were compiled, it was evident that the fat content affected the sweetness rating of the ice creams. In 10 and 12 percent fat prod-

MORE CLEANING ACTION
...LESS EXPENSE!
Do you know how much you can save with Metso Cleaner? Check these Metso economy advantages:
1 Metso is priced as a basic alkali. (Saves you money)
2 Metso curbs corrosive effect on tin and aluminum. (Saves your equipment)
3 Metso breaks up grease film quickly and rinses freely. (Saves cleaning time)
Food Plants using Metso regularly get quicker and brighter results and save them money as well. Try a barrel now. Request prices.
PHILADELPHIA QUARTZ COMPANY
EST. 1831
General Offices: 125 S. Third St., Phila., Pa. Chicago Sales Office: 205 W. Wacker Drive. Stocks in 60 cities. Sold in Canada by National Silicates Ltd., Toronto.
METSO
METSO CLEANERS

ucts, combinations of sucrose and corn sirup solids were judged sweetest more often than similar combinations of sucrose and dextrose. However, when the fat content was 16 percent or above, the sucrose-dextrose combinations were more often thought to be sweeter. The explanation for these differences probably lies in the effect of each sugar on the body and texture of ice cream.

Since the texture and composition of ice cream both affect the sweetness perception, it is logical to assume that other factors may also be involved. Until the effects of these various factors are definitely known, it is impossible to assign definite sweetness values to the various sugars which will prove reliable, in view of the existing variations in processing and composition of frozen desserts from one plant to another.

In the course of the investigation, some ice cream was held in storage for several months. Examination of the samples from time to time showed that those containing sucrose as the only sweetener became oxidized in storage slightly more rapidly than those containing corn sweeteners. There were no noticeable differences between the various corn sweeteners in this respect. The ice creams containing sucrose alone also coarsened slightly faster in storage than those containing sucrose-corn sweetener combinations. After five months of storage there were no color differences between any of the samples.

### *Conclusions*

Consumer judgments of ice creams containing corn sirup solids to replace 20 and 26⅔ percent of the sucrose reveal that the combination of sweeteners is desirable. The resultant ice creams compared favorably in sweetness with those containing sucrose alone and were preferable in body and texture.

The common corn sweeteners compare favorably in sweetening value. When they were used in ice cream to replace 26⅔ percent of the sucrose, there were but slight differences in sweetness between the finished ice creams. The variations in the body and texture and rate of melting of ice cream caused by the different corn sweeteners appear to be of greater significance than the variations in sweetness.

Corn sirup solids raise the freezing point of ice cream slightly, increase mix viscosity somewhat, decrease the rate of melting and have very little effect on the whipping ability of the product.

Ices and sherbets containing corn sirup solids in combination with sucrose are improved in body and texture and under commercial conditions are not likely to develop surface crustation.

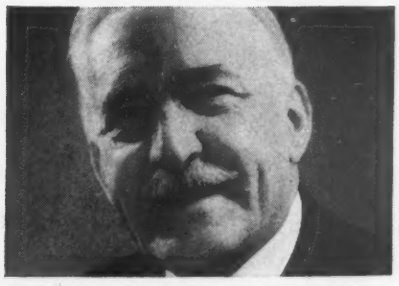

# 4 REASONS WHY

## You Should Investigate BEMIS WATERPROOF BAGS

**"INCREASE SALES"** ... *say executives.* By delivering products in better condition Bemis Waterproof Bags are building new and repeat business for scores of leading companies.

**"A MIGHTY GOOD BUY"** ... *say purchasing agents.* Comparative tests prove Bemis Waterproof Bags are a mighty good buy from every angle ... economy, service and sales.

**"TOUGHEST BAGS YOU EVER SAW"** ... *say warehousemen.* Ask the men who handle shipping containers ... they'll tell you, "For strength and toughness you can't beat a Bemis Waterproof Bag!"



**"MAKE A HIT WITH US!"** ... *say customers.* Because they keep products up to quality purchased ... handle easier ... and save storage space, Bemis Waterproof Bags make friends for their contents.

### TO MAKE YOUR PRODUCTS SERVE AND SELL BETTER... consult the Bemis Shipping Research Laboratory

There are fourteen tried and tested Bemis Waterproof Bag constructions ... one of which may provide just the added protection and economy you need. To select the proper bag, Bemis maintains a complete Shipping Research Laboratory. Here actual shipping conditions are duplicated and bag constructions tested for your particular product by chemists and practical shipping research men.

This unique service has helped increase sales and reduce costs for scores of companies throughout the country. Write for complete details at once. No obligation.

*Mail coupon now for special brochure giving valuable information on increased shipping efficiency.*

**BEMIS WATERPROOF BAGS** *are also made*

**ODORPROOF, SIFTPROOF, DUSTPROOF, LINTPROOF, ACID AND GREASE RESISTANT ...**

WATERPROOF DEPARTMENT

**BEMIS BRO. BAG CO.**

ST. LOUIS • BROOKLYN

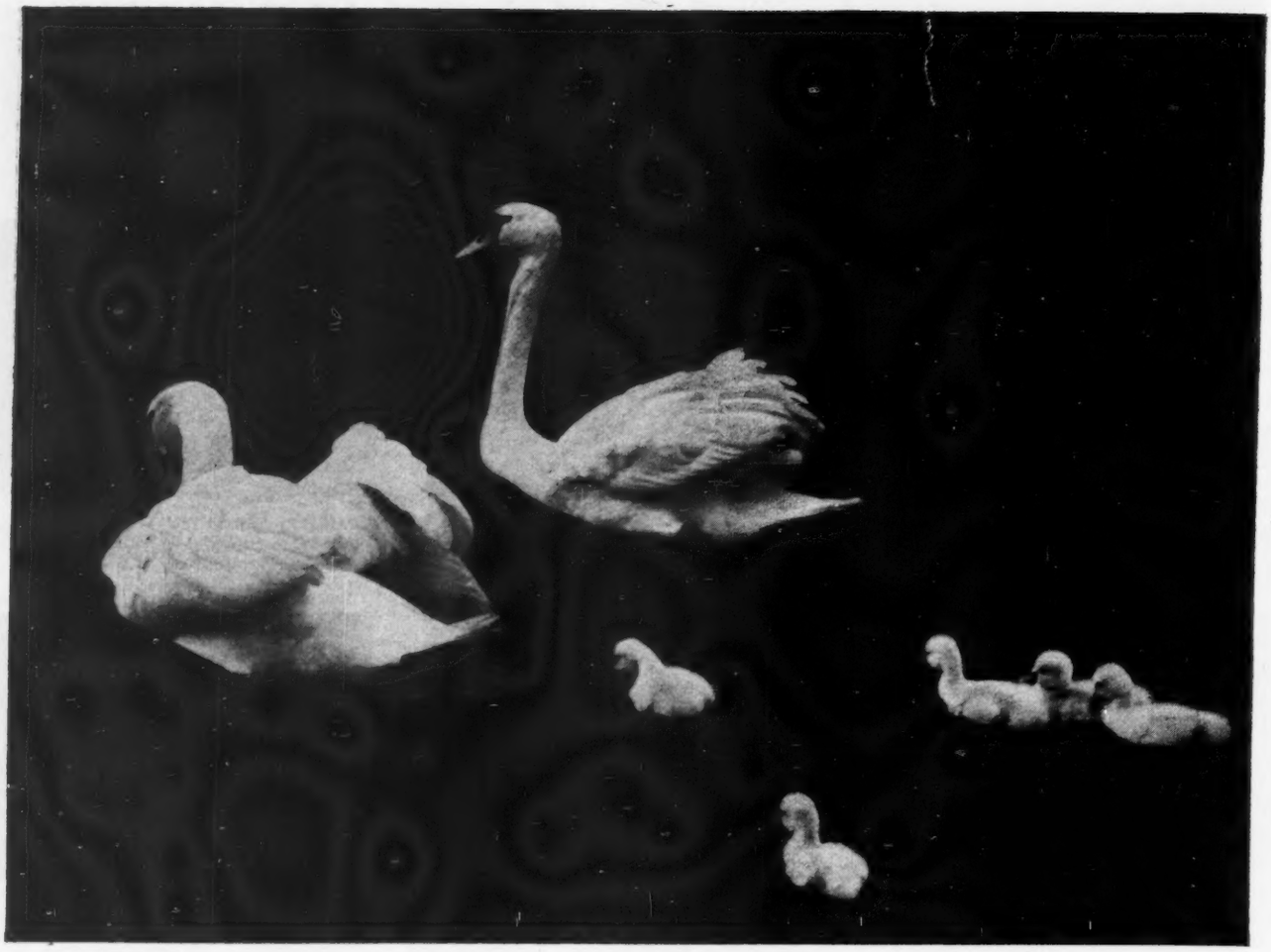
**BEMIS BRO. BAG CO.**
402 Poplar Street, St. Louis, Mo.; 5108 Second Avenue, Brooklyn, N. Y.
Please send your special brochure and details about use of Bemis Waterproof Bags for_____ (Product)

*Firm Name*_____

*Street Address*_____

*City*_____ *State*_____

*Mark for the attention of*_____



COURTESY BECK ENGRAVING CO. PHOTO BY E. D. HIBBS

# CONVOY

Food industries entrusted with the convoying of vitamins in foods to the public's digestive tracts have new high responsibility since proper health defense calls for correction of proved widespread vitamin deficiencies. Where the courses of some vitamins are beset by particularly strong "enemy" forces some losses may be unavoidable: as those due to enzymatic processes, heat, oxidation, home cooking methods, etc. Proper high vitamin values may nevertheless now be delivered at the end of the journey, thanks to the possibility of augmenting native vitamin forces with added amounts produced synthetically at low cost. • Make Roche Park your central source for pure crystalline vitamins $B_1$, $B_2$, C and nicotinic acid. Write to our Vitamin Division for help on technical problems and cost calculations.

**HOFFMANN-LA ROCHE, INC. • NUTLEY, N. J.**

*World Famous for Pharmaceutical Fine Chemicals*

# Formulas for Foods

## Transposition Table For Formula Development

By Research & Merchandising Department, *Associated Retail Bakers of America, 1135 Fullerton Ave., Chicago, Ill.*

IN OUR Bulletin No. 72 we have endeavored to give as accurate a transposition from the housewife's method of measuring—namely, the spoon-and-cup method—to the commercial ounce-and-pound method as is humanly possible.

In preparing this table we had before us eight different tables which were compiled by recognized authorities in the field of domestic science and arts. Upon close comparison we found many differences. The figures given herein have been carefully compiled and were arrived at only after repeated measuring and weighing operations in our own research bakeshop, in addition to comparison with the conversion tables used as reference.

Variations are unavoidable, due to the human element and to such factors as the differences in moisture content of ingredients from one time to another, the latter being the result of conditions such as geographic location, storage-room atmosphere and length of time ingredients are kept in storage. The moisture content of the material at the time of weighing will, of course, affect the weight of a given measurement. Also, there is a variation in the weight of a given measurement of some materials, such as cocoa, depending on the type and quality of the material.

The capacity of so-called standard measuring utensils is not always alike. Several home economics experts refer to this in their books and we, too, found this to be true. Of four "standard" measuring cups which we were using, only two were alike. Of the remaining two cups, one held ⅛ of a cup more and the other ⅛ of a cup more than the two first mentioned.

From our experience on this work we can now readily understand why one housewife excels over another in cookery, though they use the same recipes in making certain products and the same methods of mixing and baking. The cup-and-spoon method of measuring is too variable to insure success in every instance.

**When a food technologist is called upon to develop a new or better formula he should never overlook the housewife's cookbooks which contain ideas galore and directions based on many centuries of the art of cookery. To transpose the housewife's art into commercial quantities is, however, not an easy task for industry must depend on larger quantities than a cook would use. And measurements must be much more accurate in the interest of quality control. It is important, therefore, to transpose or translate household quantities correctly into avoirdupois units. Hence this set of Transposition Tables is presented.**

**Let any who disdain to refer to the lowly cookbook note carefully that this set of tables has been prepared by a trade association for the use of its industrial members. That fact is significant.—The Editors.**

### *Eggs*

It is impossible to give an exact weight for a given number of eggs, as the variation in size of eggs is so great that one large egg may easily be the equivalent of two small ones. Home economics experts, as a rule, use a medium-sized egg as the standard, this weighing 1⅓ to 1⅔ oz. after removing the shell.

### *Leavening Adjustment*

Bakers must remember that the amount of leavening agent may have to be adjusted when using a housewife's formula transposed. A cake made by the housewife by hand usually requires more leavening agent than a cake made by the baker by machine, because the machine usually incorporates more air into a mix than the housewife does by hand mixing.

### *Measuring*

Because correct methods of measuring are all-important in making test cakes from housewife recipes, we are including herein instructions for measuring some of the ingredients which are often measured improperly, with the result that the baked product is a failure.

FLOUR—Sift the flour once, in small portions. Fill the cup with a tablespoon, dipping the spoon into the flour gently and bringing it up heaping full. Put each spoonful into the cup with a light touch so that it will not pack. Level off the top with the edge of a spatula or straight-edged knife—not with the flat surface. (NOTE: A given measurement of bread flour will weigh heavier than the same measurement of cake flour.)

GRANULATED SUGAR—This should be spooned into cup—not the cup dipped into the sugar. Level off same as for flour.

POWDERED SUGAR—Sift and measure like flour.

BROWN SUGAR—There is much variance in measurements of brown sugar, but we have found that domestic science authorities measure the amount of brown sugar by packing it into the cup with a spoon. In this way the weight of a given measure of brown sugar is approximately the same as that of the granulated sugar.

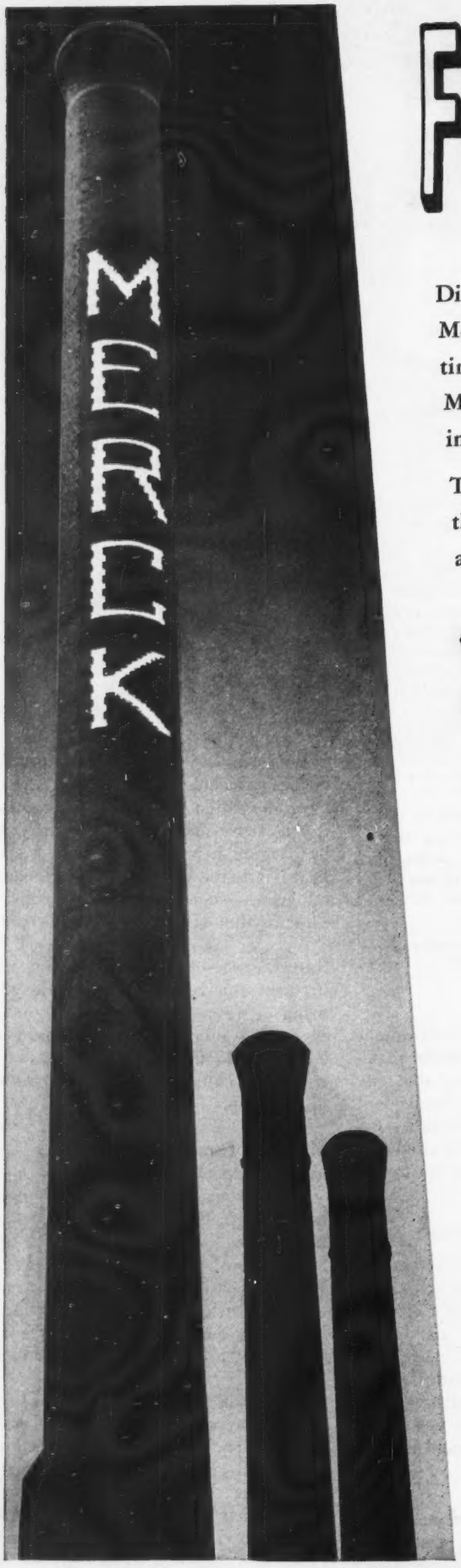
SHORTENING—Accurate shortening measurement can be best obtained by measuring in water. For instance, to measure ¼ cup of solid shortening a measuring cup may be filled three-fourths full of water and chunks of shortening added to fill the cup.

MELTED CHOCOLATE—Measure in a greased cup to avoid waste.

All measurements must be level—for instance, a teaspoonful of baking powder means that the spoon is dipped into the baking powder, brought out heaping full and then with the edge of a small straight knife or other utensil the surplus is scraped off. Be sure that edge of knife is straight and not convex or concave.

In measuring subdivisions of a cup of dry ingredients which must not be packed, such as flour, confectioners' sugar and granulated sugar, it is advisable to use the special set of measuring cups which can be secured in ten-cent stores for 15 cents a set. This set or

(*Turn to page* 120)




# FOREMOST

Discoveries and advances in the vitamin field made by Merck chemists and their collaborators have continually emphasized the outstanding rôle played by Merck & Co. Inc. in the development of these vitally important substances.

The following chronologic review briefly describes the contributions of Merck & Co. Inc. in making available many of these essential factors in pure form:

**1934** *Ascorbic Acid Merck (U.S.P.) was made available by Merck & Co. Inc.*

**1936** *Vitamin $B_1$ was synthesized in the Merck Research Laboratories.*

**1937** *Vitamin $B_1$ Merck (Thiamine Hydrochloride U.S.P.) was made available in commercial quantities.*

**1938** *Nicotinic Acid Merck (U.S.P.) became commercially available.*

**1938** *Vitamin $B_2$ Merck (Riboflavin) was the second pure crystalline vitamin to reach commercial production during that year.*

**1938** *Alpha-Tocopherol (Vitamin E) was identified and synthesized by Merck chemists and their collaborators in other laboratories.*

**1939** *Vitamin $B_6$ was synthesized in the Merck Research Laboratories.*

**1940** *Vitamin $B_6$ Hydrochloride Merck became available in commercial quantities.*

**1940** *Alpha-Tocopherol Merck (Vitamin E) was made commercially available.*

**1940** *2-Methyl-Naphthoquinone Merck, a pure chemical having marked Vitamin K activity, became available in commercial quantities.*

**1940** *Pantothenic Acid, the most recently synthesized member of the Vitamin B Complex, was identified and synthesized by Merck chemists and their collaborators.*

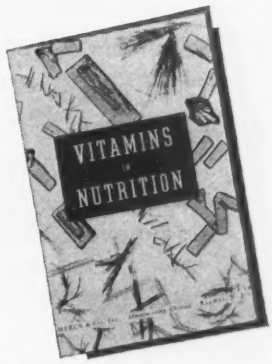
**1940** *Calcium Pantothenate Dextrorotatory, physiologically active form of Pantothenic Acid, was made commercially available by Merck & Co. Inc.*

# IN THE SYNTHESIS AND PRODUCTION OF PURE VITAMINS

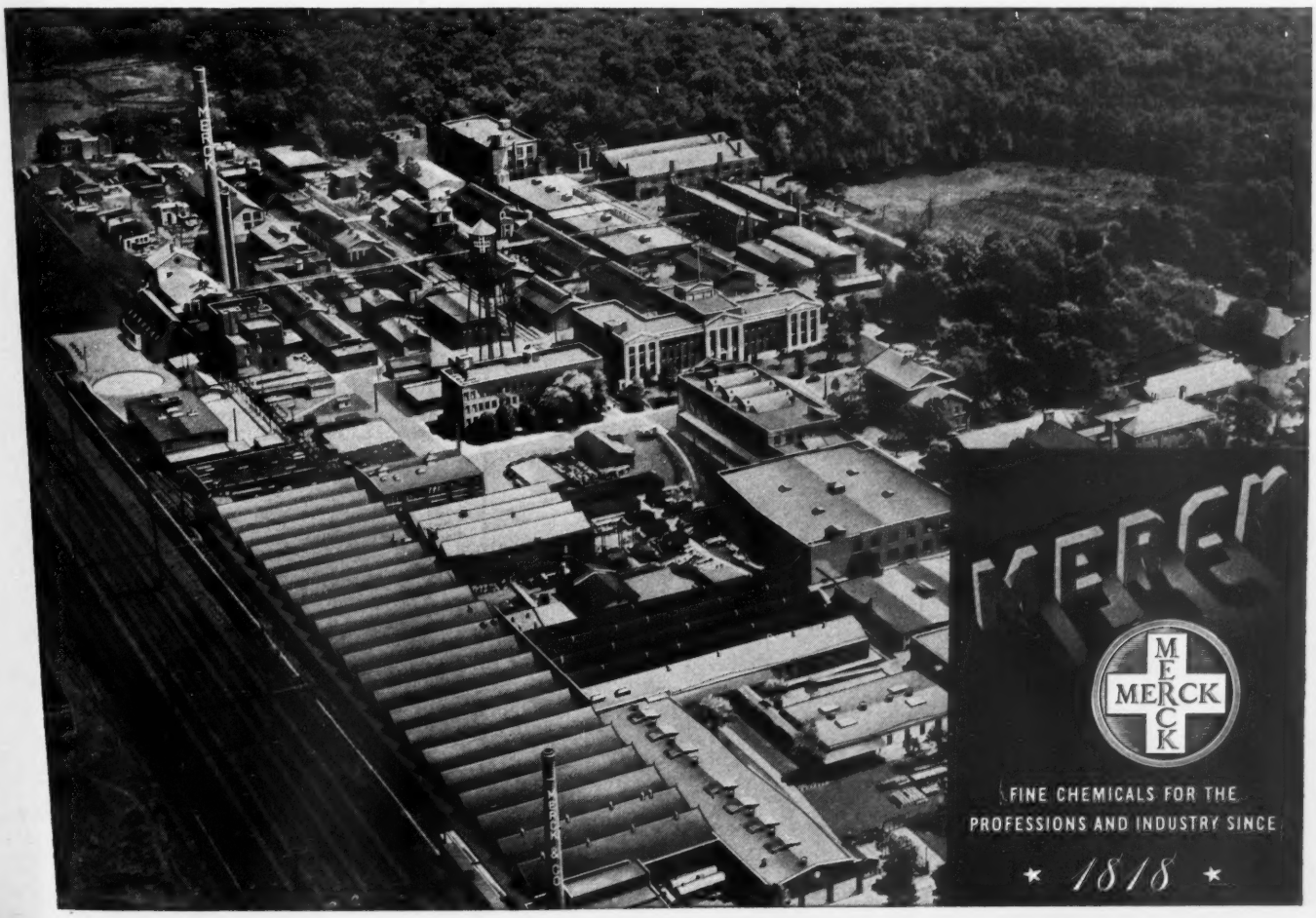
Active in the manufacture of pure vitamins ever since the first of these (Vitamin C) was synthesized, Merck & Co. Inc. occupies the foremost position in this field. The synthesis of Vitamin $B_1$—a vitally important achievement—was accomplished in the Merck Research Laboratories, thereby making the pure crystalline vitamin abundantly available for commercial use.

Backed by thorough experience, extensive resources, and modern production facilities, Merck & Co. Inc. is fully equipped and prepared to serve the food manufacturer who is interested in adding vitamins to processed foods. Our technical staff and laboratories offer valuable technical assistance in perfecting such factors as adequate distribution and retention of the vitamins, and product control methods.

**MERCK & CO. Inc.** *Manufacturing Chemists* **RAHWAY, N. J.**
**NEW YORK** **PHILADELPHIA** **ST. LOUIS**
*In Canada:* **MERCK & CO. Ltd., Montreal and Toronto**




**This up-to-date brochure, written in non-technical language, will be mailed on request.**



# Ultraviolet Rays

***Generated by Quartz Mercury Arc Lamps today have a definite place in the food Industry as demonstrated by the following usages.***

## *Vitamin D*

*Exposure of substances, which contain the necessary pro-vitamin, to the uniform and high intensity quartz mercury arc insures a high potency Vitamin D yield. Special irradiation apparatus can be designed and furnished to manufacturers of Vitamin D in its concentrated form.*

*Hanovia Milk Irradiators are widely used by the dairy industry for processing Vitamin D Milk.*

## *Vitamin A*

*All quartz Hydrogen Discharge Tubes are standard equipment with most companies which employ the photometric system for evaluating Vitamin A. These tubes are powerful sources of the continuous ultraviolet spectrum of Hydrogen.*

## *Vitamin B 1*

*Quartz mercury arc lamps, when fitted with a special filter, are convenient equipment for examining Thiamin and Riboflavin solutions by their fluorescence. Visual comparison between an unknown and known concentration enable one to make reasonably accurate evaluations.*

## *Ultraviolet Air Sanitation*

*Many industrial concerns have installed Hanovia Safe-T-Aire lamps to destroy air-borne organisms. These lamps are located in the ducts of air conditioning systems and at suitable points in processing rooms. The action is exceedingly rapid (small fraction of a second). Tubes are inexpensive to install and maintain.*

## *Ultraviolet Water Sterilizers:*

*The Hanovia Fluid Irradiator is an economical and dependable equipment valuable for destroying micro-organisms in water and other fluids without resorting to heat or the addition of chemicals.*

## *Transparent Fused Quartz:*

*Transparent fused quartz apparatus is manufactured from pure crystals in any required shape for industrial or laboratory application.*

★ Complete information on any, or all, of the Ultraviolet Equipment here described will be furnished promptly on request. Address your inquiries to

**HANOVIA *Chemical & Mfg. Co.***

**Dept. FI.** **Newark, N. J.**


nest of cups consists of a full cup measure, a half-cup measure, a quarter-cup measure and a one-third cup measure.

A set of four measuring spoons attached together, consisting of a tablespoon, teaspoon, half-teaspoon and quarter-teaspoon, can also be secured in ten-cent stores.

If more than one cup is to be used in transposition work, one will do well to see that all cups originate from a single manufacturer, since, as mentioned previously, there is a variation even between these "standard" measuring utensils.

*And Remember This*—Ordinary household or kitchen cups, tablespoons and teaspoons are not always standard size. The average household teaspoon often holds one-third of a teaspoon more than the standard measuring teaspoon.

### *Eggs*

| | |
|---|---|
| Eggs, whole (1 egg = approx. 1⅔ oz.) | 5 (8 oz.) = 1 cup |
| Eggs, whites (1 = approx. 1 oz.) | 8 (8 oz.) = 1 cup |
| Eggs, yolk (1 = approx. ⅔ oz.) | 12 (8 oz.) = 1 cup |

(10 whole shell eggs = 1 lb. approx.)

### *Flour and Cereals*

| | |
|---|---|
| Bran, dry | 2 oz. = 1 cup |
| Cornmeal (uncooked) | 5⅓ oz. = 1 cup |
| Cornstarch (unsifted) | 5⅓ oz. = 1 cup |
| Crumbs, bread, dry | 3 oz. = 1 cup |
| Crumbs, cake, dry | 3 oz. = 1 cup |
| Crumbs, cake, moist | 2¾ oz. = 1 cup |
| Flour, bread, unsifted | 4¾ oz. = 1 cup |
| Flour, bread, sifted once | 4¼ oz. = 1 cup |
| Flour, cake, unsifted | 4¼ oz. = 1 cup |
| Flour, cake, sifted once | 3¾ oz. = 1 cup |
| Flour, potato, sifted once | 6¼ oz. = 1 cup |
| Flour, whole wheat | 3¾ oz. = 1 cup |
| Oats, rolled | 3¼ oz. = 1 cup |

### *Fruits—Nuts—Peels*

| | |
|---|---|
| Apple, medium size | 1 only = 6 oz. |
| Apricots, dried cooked, no juice | 5⅓ oz. = 1 cup |
| Banana, fresh, no skin, medium size | 1 only = 3½ oz. |
| Banana, fresh, crushed | 14 oz. = 1 cup |
| Banana, dried | 3⅗ oz. = 1 cup |
| Blueberries, fresh | 5¼ oz. = 1 cup |
| Cherries, whole, candied | 7 oz. = 1 cup |
| Citron, thin sliced or cubed, in sirup | 7 oz. = 1 cup |
| Citron, cubed, dry | 6½ oz. = 1 cup |
| Coconut, long thread | 2 oz. = 1 cup |
| Coconut, macaroon | 2⅝ oz. = 1 cup |
| Coconut, moist, canned | 3 oz. = 1 cup |
| Currants | 5⅓ oz. = 1 cup |
| Cranberries, uncooked | 3⅕ oz. = 1 cup |
| Dates, whole, pitted | 6 oz. = 1 cup |
| Figs | 7 oz. = 1 cup |
| Lemon rind, grated (1 oz. = 1 lemon) | ⅜ oz. = 1 tablespoon |
| Nuts, chopped | 3¾ oz. = 1 cup |
| Orange, ground, with juice | 8 oz. = 1 cup |

(*Turn to page 124*)

$Ca_3(PO_4)_2$ CONTENT
90 GRAMS

$Ca_3(PO_4)_2$ CONTENT
3500 GRAMS

**VICTOR MINERAL SUPPLEMENTS**

- Mono Calcium Phosphate
- Di Calcium Phosphate
- Tri Calcium Phosphate
- Mono Sodium Phosphate
- Di Sodium Phosphate
- Iodized Tri Calcium Phosphate
- Sodium Iron Pyrophosphate

# YOUR PRODUCT CAN SUPPLY THIS VITAL NEED FOR MINERALS . . . AND GIVE AN ENTIRELY NEW SALES APPROACH . . . THROUGH MINERALIZATION

AN adequate intake of calcium and phosphorus through the daily diet is today accepted by the medical profession as a necessity. The calcium phosphate ($Ca_3(PO_4)_2$) content of the human body at birth is 60 to 90 grams; at middle age about 3500 grams . . . a supply that must be constantly available if bone, tooth, and nerve structure is to be properly nourished.

Nature provides us abundantly with both calcium and phosphorus in a wide selection of foods. Consumer demand, however, for highly refined foods has brought about a processing loss of these vital minerals. The most logical way to compensate for this well recognized deficiency is to enrich staple foods that people are accustomed to eat . . . rather than attempt to change tastes and habits. Already a handful of far-sighted manufacturers have found a responsive market in a mineral conscious public . . . including makers of breakfast cereals, flour, bread, etc.

From the standpoint of production, mineralization is comparatively simple. The mineral supplement may be added as a slurry or mixed in mechanically. It may be cooked in or sprayed on. The cost is negligible. The consuming public, too, will appreciate that these essential minerals are available in staple foods *at no additional cost.* A good will builder!

As the world's leading manufacturers of food grade calcium phosphates, the Victor Chemical Works has played an important part in making these vital minerals . . . calcium, phosphorus, and iron . . . readily and economically available. In advancing the cause of food fortification, our research laboratory has acquired considerable practical experience. You will find our staff of experts well qualified and anxious to serve . . . particularly when it comes to technical facts on processing and similar problems.

**VICTOR CHEMICAL WORKS**
**141 W. Jackson Blvd., Chicago, Ill.**
**HEADQUARTERS FOR MINERAL SUPPLEMENTS**

# SINCE 1890

**There has been an Increasing Number of Satisfied Customers Using**

*Miner's*
*"Fulton Maple" Flavor*

Your Choice of

*A "Pure" Concentrate or...a "Pure Base" Blend*

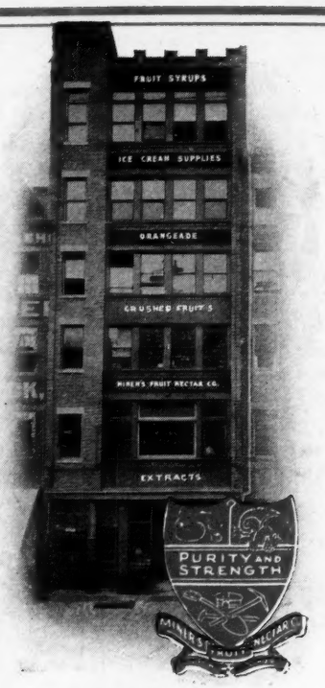
**Or Our Highly Economical and Distinctly Different**

**Imitation Maple**

## Miner's Fruit Nectar Company

***Fine Flavors for Over Half a Century***

**134 Fulton Street** **Boston, Mass.**




MINER BUILDING

***Ask Us About Our Complete Line of Flavors***

# *Vitamins* $B_1, B_2$

Apparatus according to the Combined Method for the Determination of Riboflavin and Thiamin on the same sample.

Ref: Technical paper by Dr. R. T. Conner and Dr. G. J. Straub given at the A.C.S. Meeting, St. Louis, Mo., April 7th, 1941.

We offer a complete selection of standard, as well as specially designed equipment for vitamin analysis. The Constant Reflux Apparatus, Reaction Vessel, Vacuum Receiver and Base Exchange Tube have been designed for the Combined Analysis of $B_1$ and $B_2$ referred to above.

An 8-page bulletin entirely devoted to equipment for vitamin analysis, including the new Coleman Fluorescence Meter, is available.

Food manufacturers not maintaining a chemical laboratory at present will find this bulletin extremely valuable in setting up for vitamin analysis and control.

## SCIENTIFIC GLASS APPARATUS CO.
BLOOMFIELD, N. J.

# Corn Syrup Solids

# THE *Preferred* SWEETENING AGENT

## *For Ice Cream, Ices and Sherbets*

REG. U. S. PAT. OFF.

PACKED IN 100 LB. BAGS

**AMERICAN MAIZE PRODUCTS COMPANY**

**100 EAST 42nd STREET • NEW YORK, N. Y.**

MEASURES THE VITAMINS

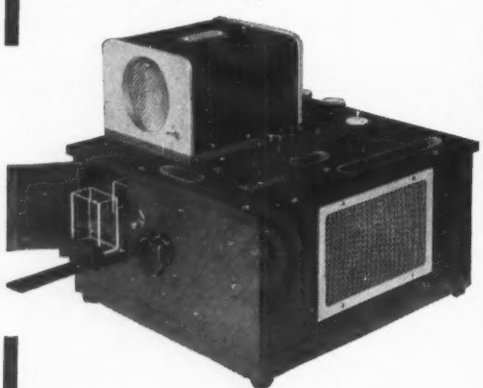
**ELECTRONIC Fluorophotometer**

$189.50 With Integral Amplifier

**The NEW Coleman Electronic is**

★ *Faster*
★ *More Sensitive*
★ *Moderately Priced*

This single purpose Fluorophotometer measures Vitamin $B_1$ and $B_2$. It is four times more sensitive! It is faster and simpler to use! It is especially suited for the COMBINED determination of $B_1$ and $B_2$ on the same sample, as announced by Conner & Straub, General Foods. IT IS MODERATELY PRICED AT $189.50! ★ **Ask for Bulletin 205FI!** ★



**Coleman UNIVERSAL Spectrophotometer**

★

*The Analyst's Dream Come True!*

★

A CHEMIST'S Spectrophotometer, at $285 . . . with accessory Mercury Lamp Illuminator which is available at $93.50. For Vitamins A, $B_1$, $B_2$, C, K . . . and every quantitative analysis in which color intensity measures the concentration of material in solution. For example, the "shaking down" of the Lead Dithizone is reduced to one simple addition of reagent and reading accomplished in HALF THE TIME! ★ **Ask for Bulletin 204F6!** ★

*Among the Users*

Amer. Inst. Meat Packers
Pabst Brewing Co.
U. of Chicago
E. A. Siebel & Co.
U. S. Fd. & Drug Adm.
Cornell University
U. of Nebraska (2)
Alaska Fisheries
Truesdail Labties.
U. of Wisconsin (2)
Fairmont Creamery Co.
Brigham Young Univ.
Ill. Dept. of Labor
Sugar Creek Creamery
Beech-Nut Packing Co.
Minneapolis Brewing Co.
Supplemental Foods, Inc.
W. F. Straub Co.
Madison Bd. of Health
Medico-Pharm. Research
Hiram Walker & Sons

*Laboratory Supplies and Chemicals*

**WILKENS-ANDERSON CO.**

111 N. CANAL ST. CHICAGO

★ *Authorized Coleman Distributor* ★

| | | |
|---|---|---|
| Orange rind, grated (1 oz. = ½ orange) | ⅜ oz. | = 1 cup |
| Peaches, dried | 5⅓ oz. | = 1 cup |
| Peels, candied | 4 oz. | = 1 cup |
| Pineapple, canned crushed, drained. | 8 oz. | = 1 cup |
| Prunes, pitted, uncooked | 7 oz. | = 1 cup |
| Prunes, pitted, cooked, drained. | 8 oz. | = 1 cup |
| Raisins | 5¼ oz. | = 1 cup |
| Rhubarb, cooked | 7 oz. | = 1 cup |

***Leavenings***

| | | |
|---|---|---|
| Ammonium carbonate | 1/12 oz. | = 1 teaspoon |
| Baking powder, cream of tartar type | ⅛ oz. | = 1 teaspoon |
| Baking powder, phosphate SAS type | ⅙ oz. | = 1 teaspoon |
| Baking soda | ⅙ oz. | = 1 teaspoon |
| Cream of tartar | ⅛ oz. | = 1 teaspoon |
| Monocalcium phosphate | ⅛ oz. | = 1 teaspoon |
| Potassium carbonate | ⅛ oz. | = 1 teaspoon |

***Liquids***

| | | |
|---|---|---|
| Cream | 8½ oz. | = 1 cup |
| Fruit juice | 8½ oz. | = 1 cup |
| Milk, evaporated | 8¾ oz. | = 1 cup |
| Milk, liquid | 8½ oz. | = 1 cup |
| Milk, sweetened condensed | 10 oz. | = 1 cup |
| Vinegar | 8 oz. | = 1 cup |
| Water | 8 oz. | = 1 cup |

***Miscellaneous***

| | | |
|---|---|---|
| Applesauce | 8 oz. | = 1 cup |
| Cheese, cottage | 7 oz. | = 1 cup |
| Cheese, grated | 4 oz. | = 1 cup |
| Cheese, Parmesan, grated | 3½ oz. | = 1 cup |
| Cheese, Philadelphia cream | 8¼ oz. | = 1 cup |
| Chocolate liquor | 1 oz. | = 1 square |
| Chocolate liquor, scraped | 4 oz. | = 1 cup |
| Chocolate liquor, melted | 8½ oz. | = 1 cup |
| Cocoa | 1 oz. | = 4 tablespoons |
| Cocoa | 3 oz. | = 1 cup |
| Coffee, ground | 3 oz. | = 1 cup |
| Gelatine | ⅜ oz. | = 1 tablespoon |
| Jam | 11 oz. | = 1 cup |
| Jelly | 11 oz. | = 1 cup |
| Marmalade | 11 oz. | = 1 cup |
| Milk, dry — full or skim | 3½ oz. | = 1 cup |
| Milk dry — full or skim | ⅛ oz. | = 1 tablespoon |
| Potato, mashed | 8 oz. | = 1 cup |
| Potato, meal | 4½ oz. | = 1 cup |
| Rice, uncooked | 8 oz. | = 1 cup |
| Yeast, compressed | ½ oz. | = 1 cake |

***Shortenings***

| | | |
|---|---|---|
| Butter | 7½ oz. | = 1 cup |
| Hydrogenated vegetable shortening | 6¾ oz. | = 1 cup |
| Lard | 7¾ oz. | = 1 cup |
| Oil | 7 oz. | = 1 cup |

***Spices Flavors***

| | | |
|---|---|---|
| Aniseed | 1/15 oz. | = 1 teaspoon |

(*Turn to page 126*)

# A "SPARK PLUG" FOR YOUR PRODUCT--

# Crystalline $B_1$ Winthrop

**Food with Added**
**CRYSTALLINE $B_1$ WINTHROP**
**100% Recommended $B_1$ Potency**

**PARTLY** as a result of the rapid swing to "enriched" flour and bread, attention of the whole food industry today is centered on foods containing increased amounts of nicotinic acid, iron and—most discussed of all—vitamin $B_1$.

**IN** "Bread Enrichment Tablets Winthrop"—containing all three nutrients in proper relation—we have provided the baking industry with an easy, economical and accurate enrichment method which has been enthusiastically received. For other food manufacturers, "Crystalline $B_1$ Winthrop" may fit more conveniently into production plans—whether foods are to be enriched with all three nutrients, or fortified with the "spark plug" vitamin $B_1$, alone.

**ADDITION** of this pure, crystalline form of vitamin $B_1$ is not only entirely practical but extremely inexpensive. For instance, for less than 5c, a whole case of 36 8-oz. packages of breakfast cereal can be "stepped-up" by 50 International Units of vitamin $B_1$ per ounce—the usual serving.

**WRITE** now for further information and new schedule of latest, *reduced* prices for "Crystalline $B_1$ Winthrop" and "Bread Enrichment Tablets." We also supply "Crystalline Vitamin C" (ascorbic acid). Prices on request.

WINTHROP
VITAMIN $B_1$
(THIAMINE HYDROCHLORIDE) U. S. P.

ADDRESS INQUIRIES TO—
*Special Markets Division*
**WINTHROP CHEMICAL COMPANY, INC.**
170 VARICK STREET, NEW YORK, N. Y.

# The Bugle Sounds for YOU!

**Supplying *America at Work* with truly nourishing food, adequately enriched with vitamins, is today a patriotic duty. But it is also an unusual business opportunity.**

**Front-page stories spread the startling news that faulty teeth rank as the most frequent cause for rejection of draftees. Accordingly Vitamin D, essential for healthy tooth and bone structure, has received a lion's share of publicity. It naturally follows that your product *enriched with Vitamin D* will be more than ever in demand.**

## COMPLETE TECHNICAL DATA ON HAND

**VITAMINS, INC., has been supplying Vitamin D Concentrate to some of the largest cereal manufacturers, to dairies, and to other food processors. We are, therefore, well qualified to recommend the best and simplest technological procedure to follow in adding Vitamin D to your product.**

## LICENSED BY WISCONSIN FOUNDATION

**As licensees of the Wisconsin Alumni Research Foundation, we supply Vitamin D made under Steenbock Patents from irradiated ergosterol. Our product is low in cost, easy to use, and has no effect on the taste, color, appearance or keeping qualities of food products. Selected users of our Concentrate will be authorized to adopt this seal, widely advertised in consumer and professional magazines. For complete information write to:**

Approved for VITAMIN D upon periodic tests

**VITAMINS, INC.**
**809 WEST 58TH STREET**
**CHICAGO, ILLINOIS**


| | | |
|---|---|---|
| Caraway seed, ground | 1/12 oz. | = 1 teaspoon |
| Cardamom seed, ground | 1/15 oz. | = 1 teaspoon |
| Cinnamon, ground | 1/12 oz. | = 1 teaspoon |
| Cloves, ground | 1/12 oz. | = 1 teaspoon |
| Flavoring extracts | ⅙ oz. | = 1 teaspoon |
| Ginger, ground | 1/12 oz. | = 1 teaspoon |
| Mace, ground | 1/12 oz. | = 1 teaspoon |
| Nutmeg, ground | 1/12 oz. | = 1 teaspoon |
| Pepper, ground | ⅛ oz. | = 1 teaspoon |
| Poppy seed, whole | 5 oz. | = 1 cup |
| Salt | 1/24 oz. | = dash or pinch |
| Salt | ⅙ oz. | = 1 teaspoon |

***Sugars***

| | | |
|---|---|---|
| Brown | 7 oz. | = 1 cup |
| Fruit | 7¾ oz. | = 1 cup |
| Granulated | 7 oz. | = 1 cup |
| Powdered 6X, sifted once | 4 oz. | = 1 cup |

***Sirups***

| | | |
|---|---|---|
| Honey | 12 oz. | = 1 cup |
| Malt sirup | 11¾ oz. | = 1 cup |
| Maple sirup | 11½ oz. | = 1 cup |
| Molasses | 11 oz. | = 1 cup |
| Sirup | 12 oz. | = 1 cup |

***Sugar Boiling Temperatures***

| | |
|---|---|
| Sirup, small thread | 218°–220° F. |
| Large thread | 228°–230° F. |
| Blow | 230°–240° F. |
| Soft ball | 242°–244° F. |
| Hard ball | 250°–255° F. |
| Small crack | 260° F. |
| Hard crack | 285°–315° F. |
| Caramel | 320°–360° F. |

FORMULA 200

## Worcestershire Sauce No. 6

| | |
|---|---|
| West Indian tamarinds | 50 lb. |
| Shallots | 12 lb. |
| Garlic | 12 lb. |
| Sugar | 50 lb. |
| Salt | 20 ½lb. |
| Cayenne | 1 llb. |
| Ginger | 4 lb. |
| Pimento* | 1 lb. |
| Cinnamon | 1 lb. |
| Mace | 8 oz. |
| Cloves | 8 oz. |
| Lime juice | 12½ gal. |
| Indian soy sauce | 5 gal. |
| Vinegar (16 grain) | 74 gal. |

* Note that this is pimento, not pimiento—The Editors.

### *Working Directions*

Boil the tamarinds with 10 gal. of the vinegar and pass through a pulping machine to remove stalks and stones. Dissolve the sugar in 10 gal. of the vinegar by boiling, and pass through a fine sieve. Place all the ingredients in a kettle and simmer for an hour. Then pass through a buhr stone mill, followed by a fine sieve strainer.


Formula from H. B. Cronshaw, London, England. Reproduction rights reserved.



(*Turn to page 128*)



# VITAMIN ANALYSIS

***BY BIOCHEMICAL & CHEMICAL METHODS***

**THE relative simplicity of biochemical and chemical methods now enables the food manufacturer to determine certain vitamin contents at worthwhile savings of time and expense.**

•

***Our laboratories are prepared to determine by these methods:***

- **$B_1$—Thiamin Hydrochloride**
- **$B_2$—Riboflavin**
- **Filtrate Factor (Pantothenic Acid)**
- **C—Ascorbic Acid**

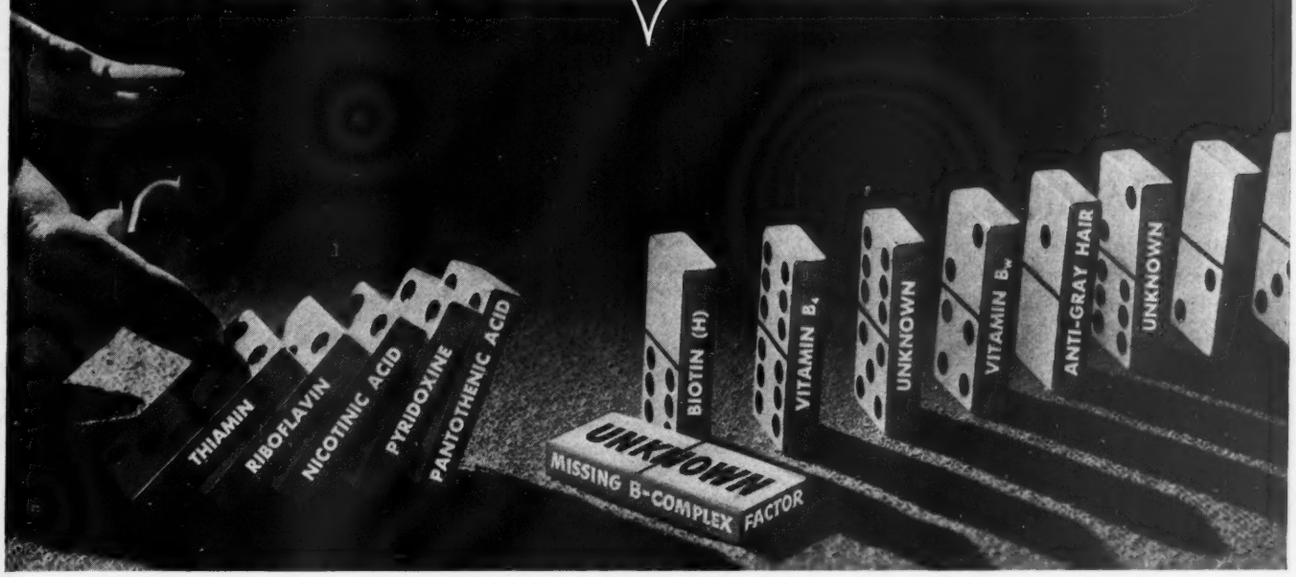
*For particulars of these and other analyses, write to*

**Schwarz LABORATORIES, Inc.**

***Food Consultants and Analysts Since 1869***

**204 EAST 44th St.**
**NEW YORK, N. Y.**

# For complete B-Complex action, you need ALL the factors




# Natural Yeast Products contain the ENTIRE VITAMIN B-COMPLEX

IT IS not yet possible to make a good diet out of a poor one deficient in the Vitamin B-Complex by adding only specific pure vitamin fractions.

Science has made remarkable progress toward solving the mystery of the Vitamin B-Complex, and five known factors of this complex have been synthetically produced for commercial use.

There are at least twelve factors, either known or believed to be present, and there is convincing scientific evidence that some or all of these vitamin factors, other than the known synthetics, are essential to effective B-Complex therapy.

Only the entire natural Vitamin B-Complex supplies all of the essential factors—known and unknown.

The following products contain the entire natural Vitamin B-Complex including both the known and unknown factors:

**Fleischmann's Pure Dry Brewers' Yeast**
**Types 200-B 90-B 50-B**

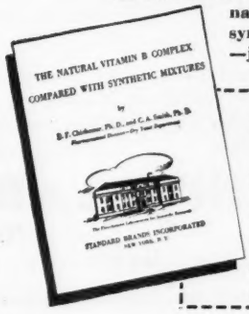
**BEE-FLEX (Natural Vitamin B-Complex Powder)**
**Types 421 and 321**

We would be pleased not only to submit samples of these products, but also to consult with your scientific, manufacturing and sales staffs regarding new uses and merchandising methods for their profitable utilization in your own formulae.

**PHARMACEUTICAL DIVISION**
**DRY YEAST DEPARTMENT**
**STANDARD BRANDS INCORPORATED**

| | Known and produced chemically | Known but not yet synthesized | Unknown |
|---|---|---|---|
| **The entire natural B-Complex** = | Vitamin $B_1$ (Thiamin)<br>Vitamin $B_2$ or G (Riboflavin)<br>Nicotinic Acid<br>Vitamin $B_6$ (Pyridoxine)<br>Pantothenic Acid | + Biotin (H)<br>Anti-gray hair factor<br>Factor W<br>Vitamin $L_2$<br>Vitamin $B_3$<br>Vitamin $B_4$<br>Vitamin $B_5$ | + ? |

## *Write for this FREE booklet*




**AN INFORMATIVE SUMMARY** of experimental evidence regarding the entire natural B-Complex compared with combinations of the known synthetic factors. Copies for your organization supplied FREE—just mail order blank specifying number desired.

Pharmaceutical Division, Dry Yeast Department
Standard Brands Incorporated
595 Madison Avenue, New York City

Please send me FREE_____ copies of "The Natural Vitamin B-Complex Compared with Synthetic Mixtures."

*Name*_____

*Company*_____

*Street*_____

*City*_____ *State*_____ F'D-1

FOOD RESEARCH LABORATORIES, INC.

RESEARCH
ANALYSES
CONSULTATION

*Specialists on*

VITAMINS

Control Assays by Biological, Chemical, Fluorometric, and Spectrophotometric Methods

Philip B. Hawk, Ph. D., *President*
Bernard L. Oser, Ph. D., *Director*
Daniel Melnick, Ph. D., *Chief Chemist*

FOOD RESEARCH LABORATORIES, Inc.
48-14 Thirty-third Street,
Long Island City, N. Y.

CALIFORNIA
EXCHANGE BRAND

*OIL LEMON*
*OIL ORANGE*

extracted from fruit that is sun ripened, under the most rigid scientific process and conditions.

Products of intrinsic merit and indispensible to the candy, food and beverage industries.

*We solicit your orders*

DODGE & OLCOTT COMPANY

180 Varick Street • New York, N. Y.
Boston • Chicago • Los Angeles
Philadelphia • St. Louis
Plant and Laboratories—Bayonne, N. J.

D & O ESTABLISHED IN 1798

FORMULA NO. 201

## Angel Food Cake

| | *Batch Weight 100 oz.* | *Batch Weight 100 lb.* |
|---|---|---|
| Egg white | 43 oz. | 43 lb. |
| Salt | ¼ oz. | 4 oz. |
| Sugar (sucrose) fruit powdered | 20⅞ oz. | 20 lb. 14 oz. |
| Cream of tartar | ¾ oz. | 6 oz. |
| Vanilla extract (pure) | ½ oz. | 8 oz. |
| Sugar (sucrose) fruit powdered | 20 oz. | 20 lb. |
| Top quality special cake flour | 15 oz. | 15 lb. |

### *Mixing Methods*

Beat egg white and salt with whip until foamy, but still wet. Add the sifted mixture of sugar and cream of tartar to foamy egg whites while beating (second speed). Stop at wet peak stage. Add vanilla extract before the flour goes in. Blend the flour and sugar by sifting *three* times. Shake this dry mix lightly over the beaten whites, folding it in. Deposit in angel cake pans with as little handling as possible. This mix will flow into place. Tap to remove large air bubbles.

Oven temperature:—Small or shelf type oven, 300 to 325 deg. F.; large, fully loaded oven, 350 to 375 deg. F.

Formula adjusted for use with Brown's Hungarian Cake Flour.

Formula from "Bakers' Cake Better than the Housewife Can Bake", by Brown's Hungarian Corp.

FORMULA NO. 202

## Whole Wheat Soy Bread

| | |
|---|---|
| Water | 24 lb. |
| Yeast | 12 oz. |
| Shortening (lard) | 12 oz. |
| Soy flour, full fat | 4 lb. |
| Salt | 12 oz. |
| Yeast food | 2 oz. |
| Malt (non-diastatic) | 12 oz. |
| Flour, first grade northern whole wheat* | 34 lb. |

* Amount of whole-wheat flour is approximate, Vary the amount accord-according to grade.

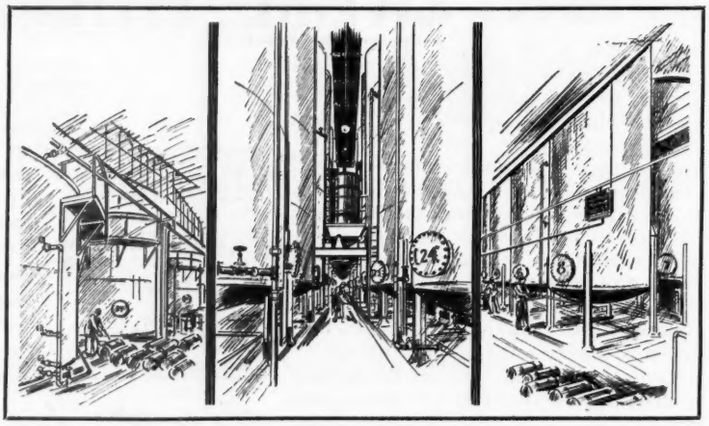
Dough time 2 hours 30 minutes. Dough temperature, 80 deg. F. Use straight dough method. First punch, 1 hour 30 minutes. Second punch, 30 minutes. Bench, 15 to 30 minutes. Put in oven at half proof. Bake at 350 deg. F.

Reason for using half proof is to obtain a finer texture. The use of steam in the oven is optional, depending on the specific characteristics desired in the crust.

Formula adjusted to Staley's No. 1 soy flour.

Formula from
A. E. Staley Manufacturing Co.

DEPENDABILITY IN VITAMINS A & D



Adequate stocks of vitamin oils and concentrates of vitamins A and/or D enable us to make prompt deliveries to manufacturers interested in the fortification of food products. In addition, careful control of every step in the manufacture of our vitamin products is maintained through our well-equipped, modern laboratories.

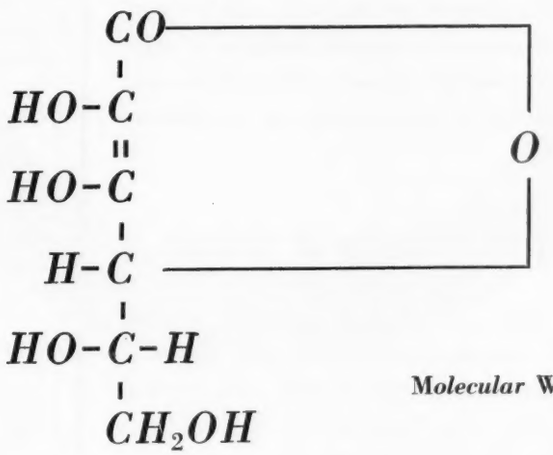
It will pay you to consult us if you are contemplating the fortification of a food product with either or both of these important vitamins. You will be under no obligation, and your inquiry will receive prompt and careful attention.

WHITE LABORATORIES, INC.
NEWARK, N. J.
MANUFACTURERS OF DEPENDABLE VITAMIN PRODUCTS

# DEPENDABLE!

**The manufacture of Pfizer Ascorbic Acid results from independent research, combined with engineering skill and operating efficiency. Our proven process and ample supply of raw materials insure uninterrupted production . . .**

## ASCORBIC ACID



*Molecular Weight*—176.06

**Ascorbic Acid (1-Ascorbic Acid) is recognized as being Vitamin C. The U.S.P. and International Units of Vitamin C are defined as 0.05 mg. of ascorbic acid; 1 gram of ascorbic acid is therefore equal to 20,000 U.S.P. or International Units.**

*Manufacturing Chemists*

PFIZER QUALITY
Est. 1849

## *CHAS. PFIZER & CO., INC.*

81 Maiden Lane, New York, New York • 444 West Grand Ave., Chicago, Illinois

# NATURAL VITAMINS A AND D OF ALL POTENCIES

From the beginning of scientific progress in this field, our Vitamin Oils division has specialized in the extraction and blending of true vitamin-bearing oils. We have worked closely with well-known food manufacturers in the solution of the problems of enrichment with vitamins A and D.

## Dependability and Uniformity of Supply

Our extensive operations in this country and numerous foreign countires enable us to supply vitamin-bearing oils, with whatever characteristics may be necessary, and to control their quality. We control every operation from the acquisition of the raw material through the extracting, refining, blending, concentrating and standardizing of the oils, for general use as well as for special purposes.

## Facilities Available to users of Vitamins

A complete laboratory with the most modern equipment for vitamin determination and control is available to food manufacturers who wish to enrich their products with vitamins A and D. Skilled technicians will help determine the proper potencies as well as the physical and chemical characteristics necessary to meet particular requirements. The services of this staff have helped food producers to work out the problems of vitamin enrichment and to control the vitamin content of the finished product.

**THE ATLANTIC COAST FISHERIES CO., INC.**

**111 John St., New York City**


FORMULA NO. 203

## Caramel Base

| | |
|---|---|
| *A* | |
| Water | 1 lb. 8 oz. |
| Brown sugar | 5 lb. |
| Butter | 1 lb. |
| *B* | |
| Sugar (granulated sucrose) | 3 lb. 5 oz. |
| Milk (powdered skim milk) | 1 lb. 11 oz. |
| Water | 2 lb. 8 oz. |

### *Working Directions*

Place ingredients *A* (water, brown sugar and butter) in a copper kettle and stir until the sugar is dissolved. Place on fire and boil to 320 deg. F. If no thermometer is available, boil to a hard crack. Wash sides of kettle with a wet brush while boiling, but do not stir.

When temperature reaches 300 deg. F., turn flame down low and boil slowly until the temperature reaches 320 deg. F.

Of the ingredients marked *B*, mix together the sugar and dry milk. Pour this mixture into the water, and stir with a wire whip until all ingredients are dissolved.

Remove kettle containing *A* from fire when temperature has reached 320 deg. F. and add gradually the mixture *B* (sugar, milk, water) while stirring *A* briskly with a wire whip. Continue this stirring until base is smooth.

If a darker color is desired, add 2 oz. of burnt sugar color. Cool base before using. Store in a covered container in a cool, dry place.

This caramel base has excellent keeping properties, and may be used as required.

Formula from Lever Brothers Co.

FORMULA NO. 204

## Maple Bonbon Coating

| | |
|---|---|
| Water | 3½ gal. |
| Condensed maple sirup (2½ fold) | 10 lb. |
| Sugar (sucrose) | 75 lb. |
| Salt | ¾ oz. |
| Egg white (beaten) | ½ pint |
| Sheet gelatine melted in 2 oz. hot water | 1 oz. |

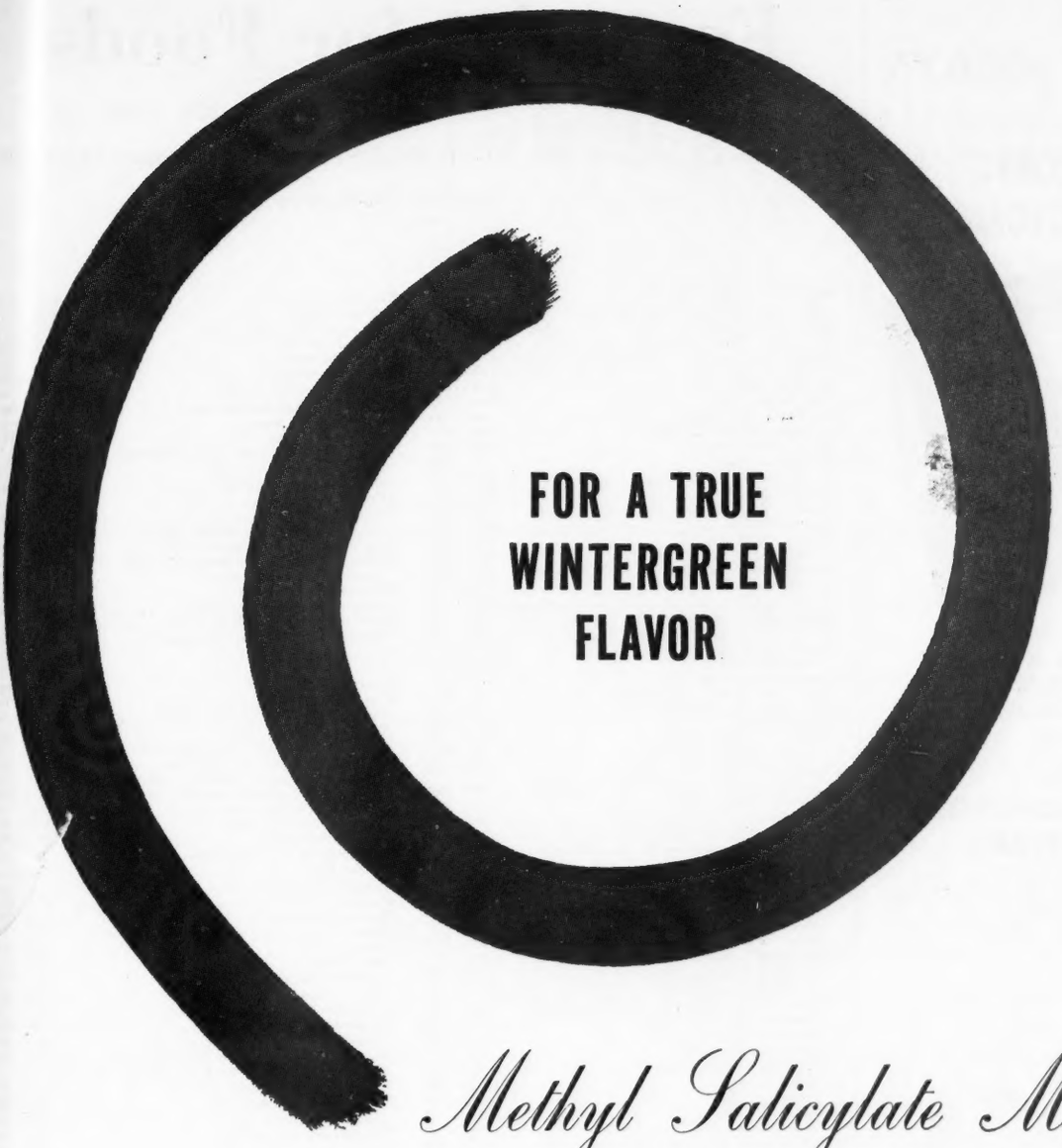
### *Working Directions*

Cook sugar, condensed maple flavor, salt and water together to 240–242 deg. F. in steam-jacketed kettle. Turn off steam and add melted gelatine.

Pour batch on Ball beater and allow to cool to blood heat (97 deg. F.) before heating. When half beaten, add egg whites which have been previously whipped to a light fluff.

Let set overnight before using. Produces a fine bonbon coating for highest-class goods.

Formula from Quebec Maple Sugar Producers.




# *Methyl Salicylate Monsanto*

**Specifications**
**Methyl Salicylate Monsanto**

***Appearance:*** water-white liquid.

***Odor:*** characteristic wintergreen, pure, sweet.

***Specific gravity:*** (at 25°C.) 1.180—1.185.

***Solubility in alcohol:*** 1.7 complete.

***Heavy Metals:*** negative.

**Other High Quality**
***Monsanto Flavorings:***
Ethavan (Ethyl Vanillin)
Vanillin Monsanto
Coumarin Monsanto

Here's an opportunity to improve quality and sales appeal of your products that you can't afford to miss!

Methyl Salicylate Monsanto is available at an extremely favorable price, and stocks are ample to take care of all requirements.

Long known for its true wintergreen flavor and aroma, Methyl Salicylate Monsanto has established itself as the standard of quality and uniformity with a large and ever-growing number of candy, chewing gum and flavor manufacturers.

See for yourself how much the high quality of Methyl Salicylate Monsanto can add to the sales appeal of *your* products. For a four-ounce sample and a quotation on your requirements, inquire: MONSANTO CHEMICAL COMPANY, Organic Chemicals Division, St. Louis, U. S. A. District Offices: New York, Chicago, Boston, Detroit, Charlotte, Birmingham, Los Angeles, San Francisco, Montreal.

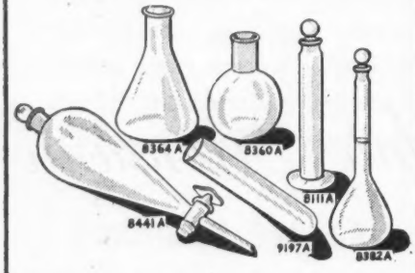
MONSANTO CHEMICALS
SERVING INDUSTRY WHICH SERVES MANKIND

for
VITAMIN ASSAYS
The New Coleman
ELECTRONIC
FLUOROPHOTOMETER

$189.50 Complete
WITH INTEGRAL ELECTRONIC AMPLIFIER
*Write for Bulletin 205*

New
AMBER LABORATORY GLASSWARE

For Vitamin Research Work in the assay of dilute vitamin solutions. (See "The Physico-chemical Assay of Vitamin A" by N. D. Embree, Industrial and Engineering Chemistry, Analytical Edition, March 15, 1941).




This Amber Glassware also has application in other fields where light may affect the chemicals, etc.

**No. 8111A—Mixing Cylinders,** with "ST" stoppers. Sizes: 10 ml — $1.80, 25 ml — $1.88, 50 ml—$2.04.

**No. 8360A—Soxhlet Type Flasks** with "ST" 24/40 outer member, suitable for extraction and refluxing. Sizes: 150 ml — $1.50, 250 ml — $1.50, 350 ml — $1.50.

**No. 8364A—Erlenmeyer Flasks.** Sizes: 125 ml — $.28, 250 ml — $.32, 500 ml — $.44, 1000 ml — $.60.

**No. 8382A—Volumetric Flasks,** calibrated to contain, with "ST" stoppers. Sizes: 10 ml — $1.36, 25 ml — $1.48, 50 ml — $1.56, 100 ml — $1.56, 250 ml — $1.76.

**No. 8441A—Squibb Separatory Funnels,** with "ST" stoppers and stopcocks. Sizes: 125 ml — $2.80, 250 ml — $3.20, 500 ml — $3.80, 1000 ml —$5.00.

**No. 9197A—Culture tubes,** round bottom, without lip. Size 25 mm diameter x 150 mm long, each. $.07.

STANDARD SCIENTIFIC SUPPLY CORP.

Biological-Chemical-Bacteriological Supplies and Reagents

34-38 West 4th Street
New York, N. Y.

# Formulas for Foods

During the last two years, FOOD INDUSTRIES has published about 200 Formulas for food products. A complete list appears below.


Angel food (dry mix) ..... June 1940
Angel food make-up using dry mix ..... Aug. 1940
Anniversary chocolate cake ..... Apr. 1941
Army field bread ..... Mar. 1941
Basic fondant ..... Jan. 1940
Barbecue sauce #1 ..... Feb. 1941
Barbecue sauce #2 ..... Feb. 1941
Beef steak sauce ..... Feb. 1941
Bel Paese type cheese ..... Oct. 1939
Benzoate of soda solution ..... Oct. 1939
Birch beer extract ..... Oct. 1939
Birch beer sirup ..... Oct. 1939
Blood and tongue sausage ..... June 1940
Bologna No. 1 ..... Nov. 1940
Bologna No. 2 ..... Sept. 1940
Braunschweiger #1 ..... Feb. 1941
Brittle wheyfers ..... Sept. 1940
Butter cream (raw) ..... Mar. 1941
Butter cream (cooked) ..... Mar. 1941
Butter cream icing (A) ..... Nov. 1940
Butter cream icing ..... Feb. 1941
Butter nut brownies ..... May 1941
Butterscotch cream base ..... Aug. 1940
Butterscotch sauce ..... Dec. 1937
Cambridge sausage I ..... Mar. 1941
Cambridge sausage II ..... Mar. 1941
Cane and maple sirup blends ..... Jan. 1941
Cane and maple sirup ..... Jan. 1940
Canned cherry cocktail ..... May 1940
Canned smoked abalones ..... Dec. 1940
Canned smoked black cod ..... May 1941
Canned smoked chum salmon ..... Feb. 1940
Canned smoked oysters, P. A. Sunderland ..... Oct. 1939
Caramel fudge sauce ..... Apr. 1940
Caramel sirup for fountain use ..... Jan. 1940
Caramels for casting ..... May 1940
Caramels for wrapping or pan caramels ..... Jan. 1940
Cast caramels ..... Nov. 1939
Catsup ..... Apr. 1941
Cherry icing ..... Jan. 1941
Cherry sirup (imitation) ..... Mar. 1941
Cheese cake (light) ..... Jan. 1940
Cheese filling ..... Jan. 1940
Chocolate caramels ..... Jan. 1941
Chocolate cream centers ..... Jan. 1940
Chocolate cream icing ..... Feb. 1941
Chocolate-flavored sirup (single-strength) ..... July 1940
Chocolate flavored syrup ..... Nov. 1939
Chocolate fudge base ..... Feb. 1940
Chocolate fudge icing ..... Apr. 1940
Chocolate fudge icing ..... Apr. 1941
Chocolate glace ..... Feb. 1941
Chocolate icing ..... Jan. 1941
Chocolate icing ..... Apr. 1941
Christmas bouquet fruit cake ..... Sept. 1939
Citrus fruit peels that won't discolor ..... Apr. 1940
Coconut cream pie ..... Jan. 1940
Coconut custard pie filling ..... Feb. 1940
Coconut devil's food cake ..... Oct. 1940
Coffee sirup ..... Feb. 1940
Cooked beef loaf ..... July 1940
Cream-type icing stock ..... Nov. 1940
Crushed pineapple or pineapple topping ..... Nov. 1939
Crushed strawberries ..... Feb. 1941
Danish pastry dough ..... Jan. 1941
Dark fruit cake batter ..... Dec. 1940
Dark fruit cake (rich type) ..... Dec. 1940
Date nut bread—date nut pudding ..... Aug. 1940
Delicious luncheon loaf ..... June 1940
Dextro-milk beverage, Corbett & Tracy ..... Oct. 1939
Devils food cake made with lard ..... 1940
Diabetic bread ..... May 1941
Doughnut icing glace ..... May 1940
Dry blend cake mix for reduced operating expenses ..... Oct. 1939
Experience with publication of formulas (ed) ..... Sept. 1940
Fondant butter cream ..... Oct. 1940
Form cakes or Turk's heads ..... Oct. 1940
Frankfurts No. 1 ..... Apr. 1940
Frankfurts No. 3 ..... Mar. 1940
Frankfurts #4 ..... Mar. 1941
Frappe ..... Feb. 1940
French pastry cream ..... Apr. 1941
Fresh farmer sausage ..... Apr. 1940
Fruit acid ..... Nov. 1939
Fruit mixture ..... Apr. 1940
Fudge Sept. 106 ..... Nov. 1940
Fudge (cheap) ..... Aug. 1940
General directions for sausage manufacturing ..... Dec. 1939
Genuine dill pickles ..... July 1940
Germany concocts some unusual food formulas ..... Apr. 1940
Ginger extract ..... Nov. 1940
Glace doughnuts ..... July 1940
Grape sirup for carbonation ..... Mar. 1941
Halibut "cheeks" canned in jelly ..... Jan. 1941
Homemade boiled icing ..... Oct. 1940
Home made fudge icing ..... Apr. 1941
Home style dill pickles ..... Mar 1941
Hot cocoa powder ..... Mar. 1940
Hot cross buns ..... Feb. 1940
How to use dry milk solids ..... Feb. 1940
Imperial chocolate icing ..... Apr. 1941
John Bull sauce ..... May 1940
John Bull sauce—2 ..... July 1940
Lean basic sweet dough ..... Feb. 1940
Lemon and lime-flavored juice ..... July 1940
Lemon-flavored sirup ..... June 1940
Lemon pie filling ..... Feb. 1941
Liquid seasoning for New England style baked beans ..... Oct. 1939
Liver and bacon sausage ..... Mar. 1940
Liver loaf ..... May 1940
Liver pudding ..... Oct. 1940
Luxury pickle and pimiento loaf ..... Dec. 1940
Maple walnuts (imitation maple) ..... Dec. 1939
Marshmallow fluff (stock) Jan. 94; corrected to marshmallow cream ..... Mar. 1940
Marshmallow topping ..... Oct. 1940
Master sweet dough mixture ..... Apr. 1940
Mayonnaise ..... Nov. 1939
Medium rich basic sweet dough ..... Dec. 1939
Mincemeat ..... Oct. 1939
Mint pineapple ..... Feb. 1941
Mustard sauce ..... Feb. 1941
Pineapple sirup ..... Nov. 1939
Mince luncheon specialty (two) ..... Feb. 1940
Mixed dill pickle spices ..... July 1940
New England plum pudding ..... Dec. 1940
New England style pressed ham ..... Jan. 1940
Nougat centers for chocolate dipping ..... Sept. 1940
Old fashioned spice cake base (dry blend) ..... June 1940
Olive and pimento loaf ..... Sept. 1940
Orange doughnut glace ..... July 1940
Orange marmalade ..... Mar. 1941
Orange sirup for carbonation ..... Mar. 1941
Peanut bar ..... Oct. 1940
Peanut brittle No. 1 ..... Nov. 1940
Peanut brittle No. 2 ..... Dec. 1940
Peanut brittle #3 ..... Jan. 1941
Pecan nugats ..... Apr. 1941
Pecan rolls ..... Apr. 1940
Pilot bread ..... Nov. 1940
Polish sausage No. 1 ..... Sept. 1940
Polish sausage No. 2 ..... Oct. 1940
Prepared doughnut flour ..... Nov. 1939
Prepared horseradish ..... Apr. 1941
Prepared pancake flour ..... Apr. 1941
Prepared pancake flour (blend type) ..... Dec. 1939
Prepared pork and bean seasoning, New England style (concentrated) ..... Oct. 1939
Prepared waffle flour ..... Mar. 1940
Preserving citron ..... Mar. 1940
Prune corn flake whip ..... Oct. 1940
Punch sirup ..... Apr. 1941
Quick cure for sausage ..... Dec. 1939
Raspberry sirup ..... May 1941
Rich basic sweet dough ..... Feb. 1940
Root beer extract ..... June 1940
Root beer sirup (imitation) ..... June 1940
Salami Cotto ..... July 1940
Sauer ruben ..... Sept. 1940
Short bread cookies ..... Sept. 1940
Short dough topping ..... July 1940
Smoked chum salmon hors d'oeuvres ..... Mar 1940
Smoked metwurst ..... Sept. 1940
Smoked turkey ..... Feb. 1940
Soy bread ..... May 1941
Soybean bread (15%) straight dough method ..... Mar. 1941
Spice cake ..... June 1940
Stock fondant ..... Dec. 1939
Stollen ..... Apr. 1940
Strawberry-flavored sirup June 104; correction ..... Aug. 1940
Strawberry preserves ..... Mar. 1941
Summer sausage ..... July 1940
Sweet orange fingers ..... Jan. 1941
Taffy ..... Oct. 1940
Tea biscuit ..... Feb. 1940
Tenderlite marshmallow ..... Nov. 1939
Tomato soup ..... Apr. 1941
Tomato soup ..... May 1941
Vanilla caramels ..... May 1941
Vanilla extract ..... Mar. 1940
Vanilla icing ..... Apr. 1940
Veal style loaf ..... Mar. 1941
When you are developing formulas (ed) ..... May 1940
White cake made with lard ..... Dec. 1939
Whole strawberries ..... Nov. 1940
Wine cake ..... May 1940
Worcestershire sauce No. 1 ..... Apr. 1940
Worcestershire sauce No. 2 ..... Aug. 1940
Worcestershire sauce No. 3 ..... Sept. 1940
Worcestershire sauce #4 ..... Mar. 1941
Worcestershire sauce No. 5 ..... Nov. 1940
Worcestershire sauce—concentrate June 104; correction ..... Aug. 1940
Yellow cake made with lard ..... July 1940
Yorkshire relish ..... Sept. 1940